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THE DEVELOPMENT AND DIET OF CHINESE CHILDREN *

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AND
HSIA SHENG
PEKING, CHINA

In a previous paper by one of us,[1] read before the China Medical Missionary Association in Shanghai, in February, 1923, it was remarked, in conclusion, that:

> Our fundamental problem in pediatrics (in China) is the collection of statistics, both of mortality and morbidity, in infant and child life, together with the determination of the standards of health in China, and the relation to these standards of Chinese foods.

In early life health may be measured by a consideration of growth in its various manifestations; but growth varies with differences in race, geographic environment, quantity and quality of food supply and stage of civilization. All these factors will have a bearing on growth in direct proportion as their effects are apparent in the adult. It is not our intention to analyze these relations in detail, nor is it possible to do so in China at present; but it is important that we recognize that they exist.

Our purpose in making this present study is:

1. To help to determine the normal growth standards of the Chinese child.

2. To determine factors of influence in the development of these standards.

3. To correlate especially the food factor.

It is understood that our studies at present cover only a small area of North China, and include a limited number of cases. It is also recognized that no immediate solution of our problems is in sight; but it is hoped that further work by other investigators, together with an extension of our own, may open the way to this knowledge.

In this paper, therefore, we present a study of the measurements of ninety-six Chinese boys living in the School for Poor Children in the

* Received for publication, March 31, 1925.

* From the Pediatric Clinic of the Department of Medicine, Peking Union Medical College.

1. Hammond, John: Some Problems of Pediatrics in China, China M. J. (Feb.) 1924.

north part of Peking, and also a study of the actual diets used by them. It is proposed to report on the teeth of these children and to make certain metabolic studies at a later period.

The School for Poor Children has been in existence for twelve years, and is carried on by private subscription, under the directorship of Mr. Hsung Hsi Ling. The children either are orphans or, for the most part, are waifs from famine areas. This fact will have some bearing on the interpretation of our measurements as it indicates the presence of a developmental handicap in their lives. We hope to show, however, from the measurements of other Chinese children, that this source of error is not of serious importance. The children have been in the school from two to ten years, the longer periods predominating. They came from the following provinces, in the following numbers: Chihli, 66; Shantung, 1; Hunan, 23; Shansi, 1; Hupeh, 3; Kiangsu, 1 and Honan, 1. As it happens, the Hunan children have remained for the longest period. The school building was originally the residence of a high Manchu official. The houses are one-storied, Chinese rooms, arranged in large compounds and are well adapted to the work carried on in the school. Ventilation and light are sufficient. The living conditions do not conform to the highest American standards but are perfectly satisfactory and highly creditable under the circumstances. The schoolrooms and workrooms are especially light and airy. The entire plant, including the kitchen, is kept scrupulously clean.

The children rise at 5:45 a. m., and retire at 9 p. m. Those over 14 (Chinese age), work eight hours a day in their rug factory. We had many opportunities of observing their work, which proved to be of a fairly high type of skilled labor. The boys worked quietly and quickly, without sign of fatigue, responding alertly and intelligently when spoken to. These workers also have two hours of study in the evening. The younger boys have four hours of study every day and four hours devoted to recreation, which consists of setting-up exercises, marching, basket ball, and a certain amount of unorganized play. The living conditions correspond well to those of lower middle-class Chinese life; the food and the daily routine are both quite characteristic of the poor Chinese farmer or the ordinary coolie. The clothing is likewise characteristic of the poor farmer class, consisting, as it does, of trousers and jacket of coolie cloth for summer use (it being understood that the jacket is of somewhat ceremonial importance and is discarded at work times), and of padded cotton, quilt-like jacket and trousers for winter. This last garment is of some importance, as it must conserve heat very efficiently during the cold weather.

The measurements were taken in August, and the boys wore no clothes except short coolie cloth trousers, the weight of which was considered of no consequence, and neither shoes nor stockings. Their

heads were shaved. The diets were observed and recorded on September 13; the temperature for this period ranged from 58 to 68 F.

Attention is called to the determination of age. The Chinese custom is to call a child 1 year old at birth, and from then on to add 1 year as each Chinese New Year is passed. Therefore the chance for inaccuracy is normally great in this matter. A child born several days before a Chinese New Year might be called 2 years old, when his real age was only 1 week or 10 days. (As a matter of fact, the Chinese will usually give the child's age in actual days or months when under 2 years, foreign count.) In this series it was felt that too few actual birthdays were known by the boys themselves to be of assistance, so that the following plan was adopted: One and a half years were subtracted from the age of each boy, so that, for example, one who gave the age of 16 would be classed as 14½ years.

A sample measurement chart is presented which is self-explanatory (Chart 1). This chart was modified from one used by the Anatomy Department, and during its compilation was rearranged on the advice of Dr. P. H. Stevenson of that department. The observations for the most part fit the standard requirements for the determining of anthropometric data, to which certain others have been added. Under the title "General Nutrition," four grades for marking have been added. Grade 1 indicates that the general nutrition is excellent, Grade 2 that it is fair, Grade 3 that it is poor and Grade 4 that it is very poor. In estimating these conditions, consideration was given to: general appearance, muscle tone, bony development, teeth, tissue turgor and mental alertness. Under the heading "Miscellaneous," we recorded observations on the condition of the teeth; these observations were cursory, designed merely to give us a lead in further work in this direction. The number of teeth in each mouth and the number of cavities were counted. The result was startling. In this superficial examination only fourteen cavities were found in the entire series. Oral hygiene was obviously lacking; the teeth were dirty, and at times had a peculiar yellow coat, which in some instances could be taken off in scales, and in others rubbed off with a throat stick, exposing perfectly white enamel underneath. A further and more complete study of their mouths will be added later, but as a preliminary report we may say that their mouths, mucous membranes, tonsils, glands and teeth were in surprisingly fine condition.

GROWTH CURVES

Charts 2 to 9 represent the growth curves of the children in the School for Poor Children, with which are compared corresponding curves taken from children of various summer schools in Peking. The

ANTHROPOMETRIC DATA ON GROWTH AND DEVELOPMENT

P.U.M.C. DEPARTMENT OF ANATOMY, AND PEDIATRIC CLINIC

Sex..... Serial No.....

Corrected age.....

Birthplace..... Stated Age..... Date of Birth.....
(Province) (District) (Cyclic Year and Month)

Birthplace of Father..... of Mother.....

Name..... Address..... Place of Observation..... Date.....

MEASUREMENTS

General Nutrition 1 2 3 4

BODY

Weight.....

Heights:

1. Standing.....
2. Sitting.....
3. Tragus.....
4. Suprasternale.....
5. Umbilicus.....
6. Symphysis.....
7. Iliospinale.....

(Calculated Lengths)

8. Neck (3-4) .....
Trunk lengths
9. With neck (2-29).....
10. Minus neck (2-(8+29)).....

Diameters

11. Acromial.....
12. Iliocristal.....
13. Trochanteric.....

Chest (at meso-sternum)

14. Breadth .....
15. Depth .....
15A. Girth .....

EXTREMITIES

Upper	Lower
16. Upper arm.....	21. Thigh (6-22+10%) .....
17. Fore arm.....	22. Lower leg.....
18. Hand length.....	23. Foot length .....
19. Hand breadth.....	24. Foot breadth.....
20. Total arm length (16+17+18)	25. Total leg (21+22) .....
	25A. Approx leg (1-2).....

26. Span.....

HEAD

27. Length .....
28. Breadth.....
29. Height (1-3) .....

FACE

Heights

30. To Nasion .....
31. To Crinion .....

Breadths

32. Min. Front.....
33. Bizygomatic.....
34. Bigonial.....

INDICES

Ponderal Index $\left(\frac{W^{\frac{1}{3}}}{1} \times 100\right)$ .....

Span-Stature $\left(\frac{26 \times 100}{1}\right)$ .....

Trunk Stature Indices

(a) $\left(\frac{2 \times 100}{1}\right)$ .....

(b) $\left(\frac{9 \times 100}{1}\right)$ .....

(c) $\left(\frac{10 \times 100}{1}\right)$ .....

Neck Trunk Index $\left(\frac{8 \times 100}{10}\right)$ .....

Body Breadth Indices

Cristal $\left(\frac{12 \times 100}{11}\right)$ .....

Trochanteric $\left(\frac{13 \times 100}{11}\right)$ .....

Chest Index $\left(\frac{15 \times 100}{14}\right)$ .....

Extremity Indices

Fore-upper arm $\left(\frac{17 \times 100}{16}\right)$ .....

Total arm-stature $\left(\frac{20 \times 100}{1}\right)$ .....

Hand Index $\left(\frac{19 \times 100}{18}\right)$ .....

Lower leg-thigh $\left(\frac{22 \times 100}{21}\right)$ .....

Leg-stature $\left(\frac{25 \times 100}{1}\right)$ .....
or
$\left(\frac{25A \times 100}{1}\right)$ .....

Leg Trunk Index $\left(\frac{25A \times 100}{2}\right)$ .....
SKELIC INDEX (MANOUVRIER)

Foot Index $\left(\frac{24 \times 100}{23}\right)$ .....

Intermembral Index $\left(\frac{20 \times 100}{25}\right)$ .....

MISCELLANEOUS

_____

_____

_____

_____

Head and Face Indices

Cephalic Index $\left(\frac{28 \times 100}{27}\right)$.....

Cephalic Module $\left(\frac{27+28+29}{3}\right)$.

Height-length $\left(\frac{29 \times 100}{27}\right)$.....

Height-breadth $\left(\frac{29 \times 100}{28}\right)$.....

Facial Indices

(a) Physiognomic $\left(\frac{33 \times 100}{31}\right)$.....

(b) Anatomical $\left(\frac{33 \times 100}{30}\right)$ .....

Bigonial $\left(\frac{34 \times 100}{32}\right)$ .....

N.B. for record of teeth see reverse side

FORM 488

Chart 1.—Sample measurement chart.

latter children were of the middle class type and were measured at the same time. Their curves and diets will be reported later. The comparison was made at this time in order to see whether the curves of these types show much variation, and it is felt that on the whole the curves of the first group of school children are well checked up by those of the second group. In all subjects but one, these curves were compared

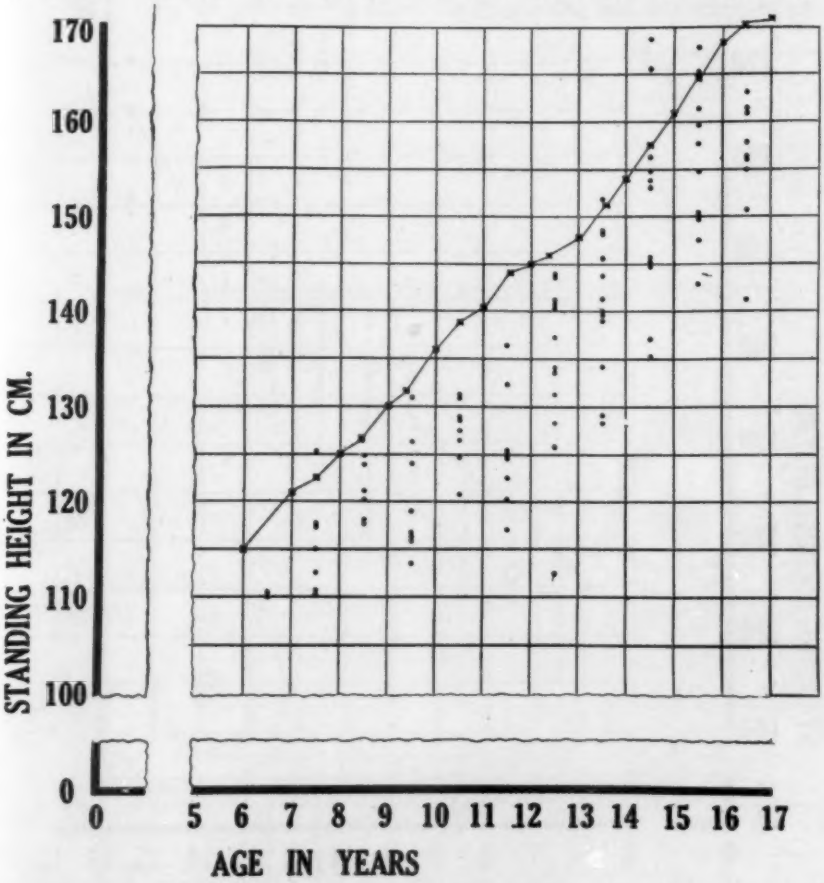

Chart 2.—Growth curves in standing height. Boys in school for poor children indicated by period; American boys, according to Baldwin's method, indicated by star.

with the corresponding curves of American boys, after the method of Baldwin;[2] the curves in standing height and weight were compared with the curves of American boys, after the method of Holt.[3]

2. Baldwin, Bird T.: The Physical Growth of Children from Birth to Maturity, Iowa City, Univ. of Iowa Press.

3. Holt, L. Emmett: Standards for Growth and Nutrition, Am. J. Dis. Child. **16**:359 (Dec.) 1918.

Standing Height.—The curve of the Poor Children very definitely runs below the American curve, and it will be seen that the Summer School curve nearly corresponds, being only slightly higher. This relation between the three curves is practically constant in nearly all the charts, excepting only that of the Sitting Height chart. The Summer School approaches the American line in adolescence, but at this point the observations are still too few.

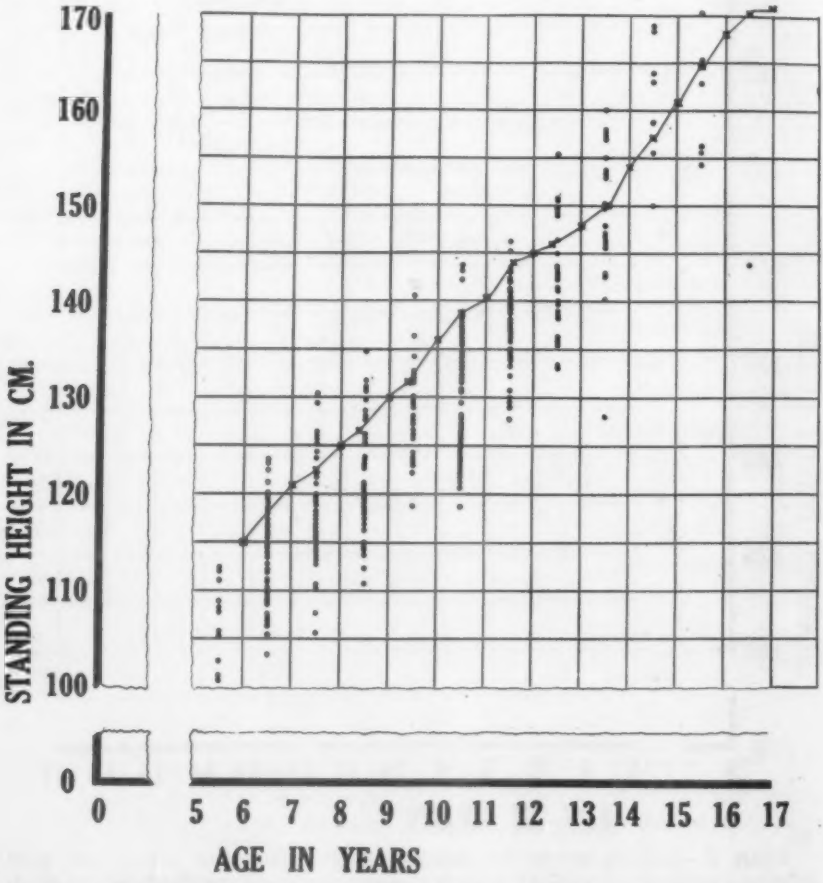

Chart 3.—Growth curves in standing height. Boys in summer school indicated by period; American boys, according to Baldwin's method, indicated by star.

Sitting Height.—Here the curve of the Poor Children is distinctly below the two other curves which, curiously, are nearly the same in their outline. The difference between the Poor Children and the other children in this respect is not so marked as in the other curves.

Weight.—Here the three curves show practically the same relation as was shown in the Height curves.

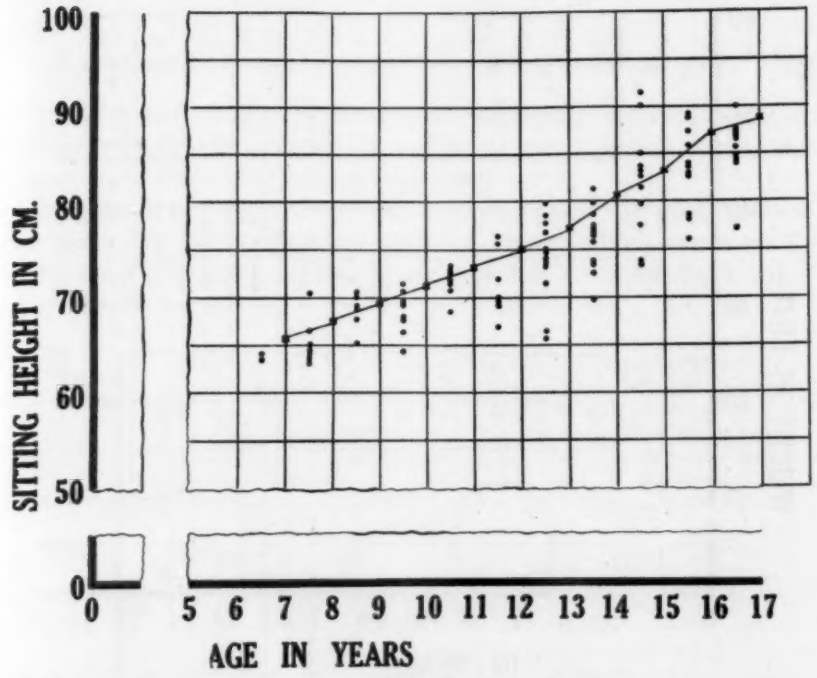

Chart 4.—Growth curves in sitting height. Boys in school for poor children indicated by period; American boys, according to Baldwin's method, indicated by star.

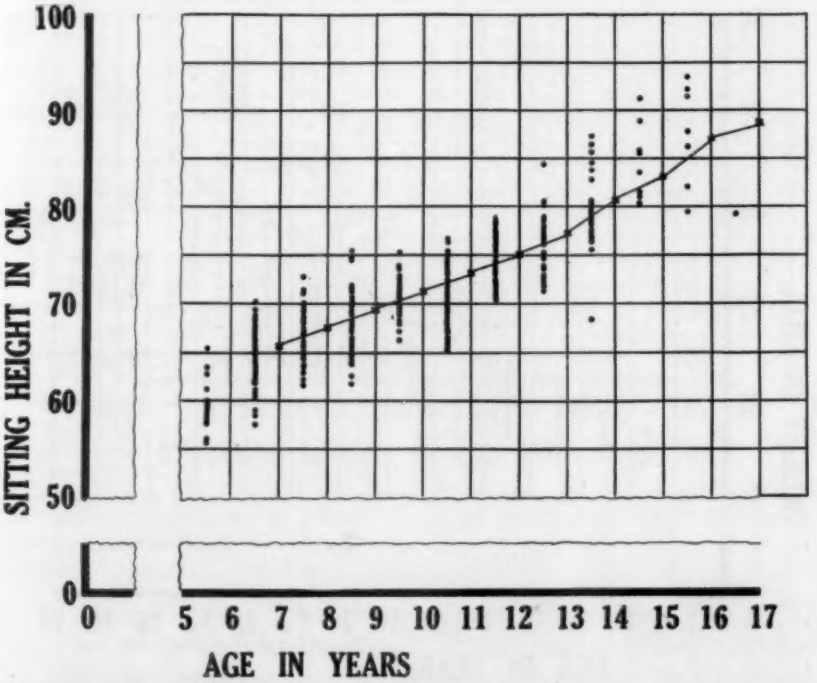

Chart 5.—Growth curves in sitting height. Boys in summer school indicated by period; American boys, according to Baldwin's method, indicated by star.

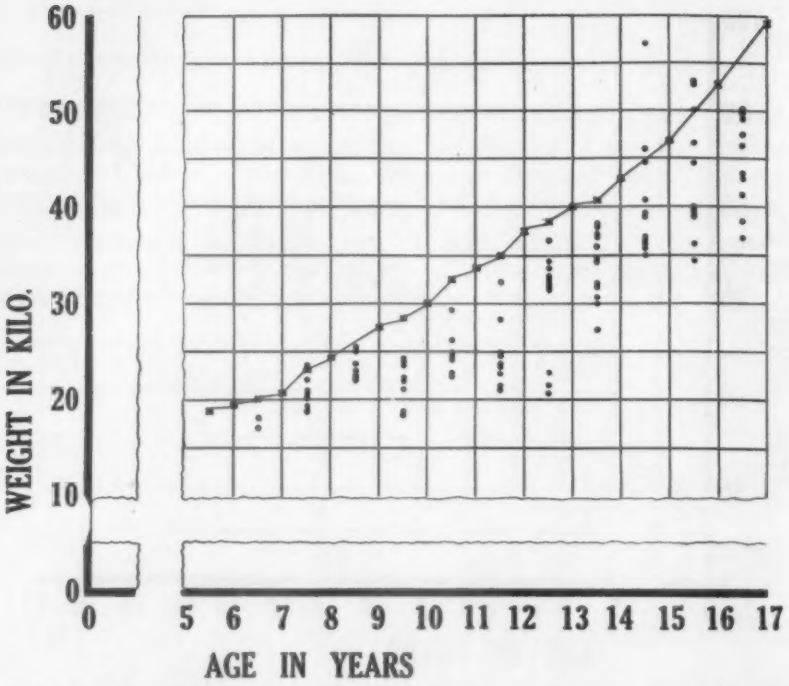

Chart 6.—Growth curves in weight. Boys in school for poor children indicated by period; American boys, according to Baldwin's method, indicated by star.

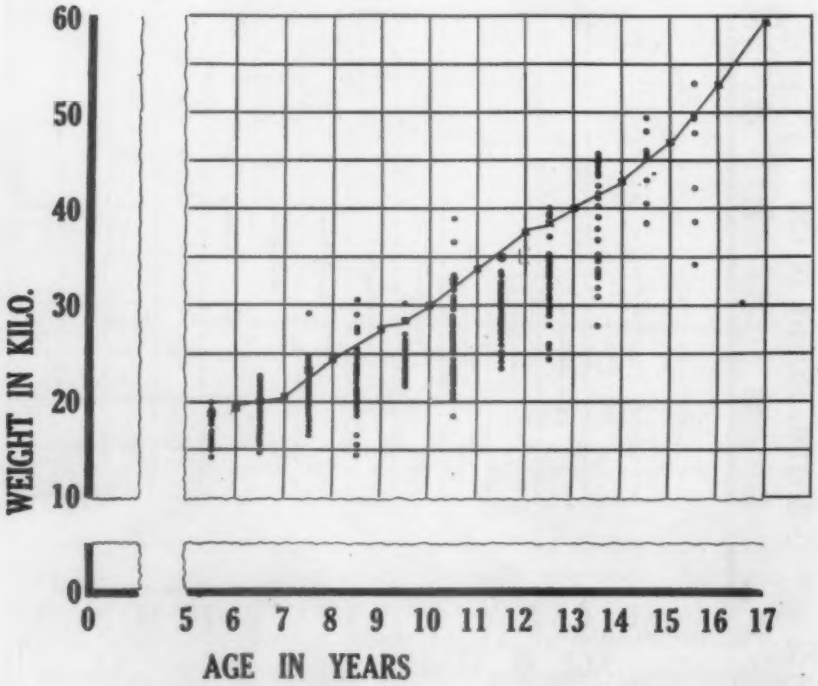

Chart 7.—Growth curves in weight. Boys in summer school indicated by period; American boys, according to Baldwin's method, indicated by star.

Height and Weight.—This is an extremely interesting curve, because both Chinese schools fall well below the American normal and differ very slightly, if any, from each other.

In general, we believe that the Chinese children in this neighborhood, one which may be fairly representative of North China, are normally below American height and weight and even below the American height and weight relation.

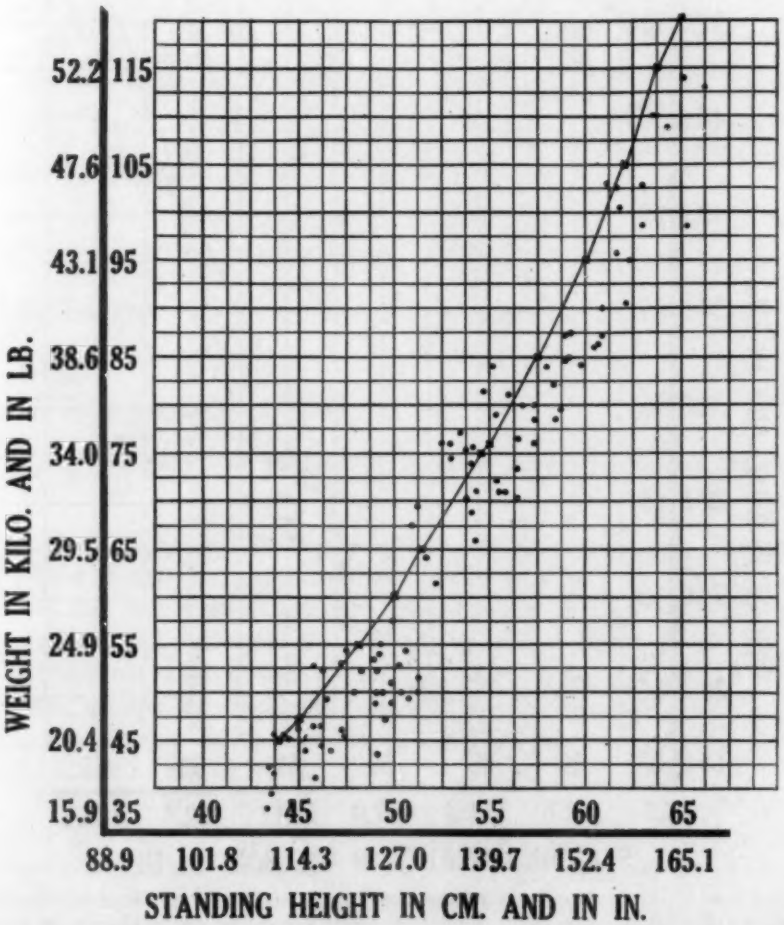

Chart 8.—Growth curves in standing height and weight. Boys in school for poor children indicated by period; American boys, according to Baldwin's method, indicated by star.

DIETS

In working out the diets which these boys followed, one of us (H.), spent two entire days at the school actually measuring and weighing the food eaten. At first, nine boys were selected: three, aged 8 years; three, aged 12 years, and three, aged 16 years. Their food intake for

an entire day was recorded. There can be but little source of error, as the boys have no money, are not allowed to leave the school grounds, and receive no food any other time except at their meals. There are two observations that require explanation: a certain amount of added oil, about 5 c.c. daily to each child, is recorded; and it was discovered that twice a week a small amount of pork was added in the cooking of

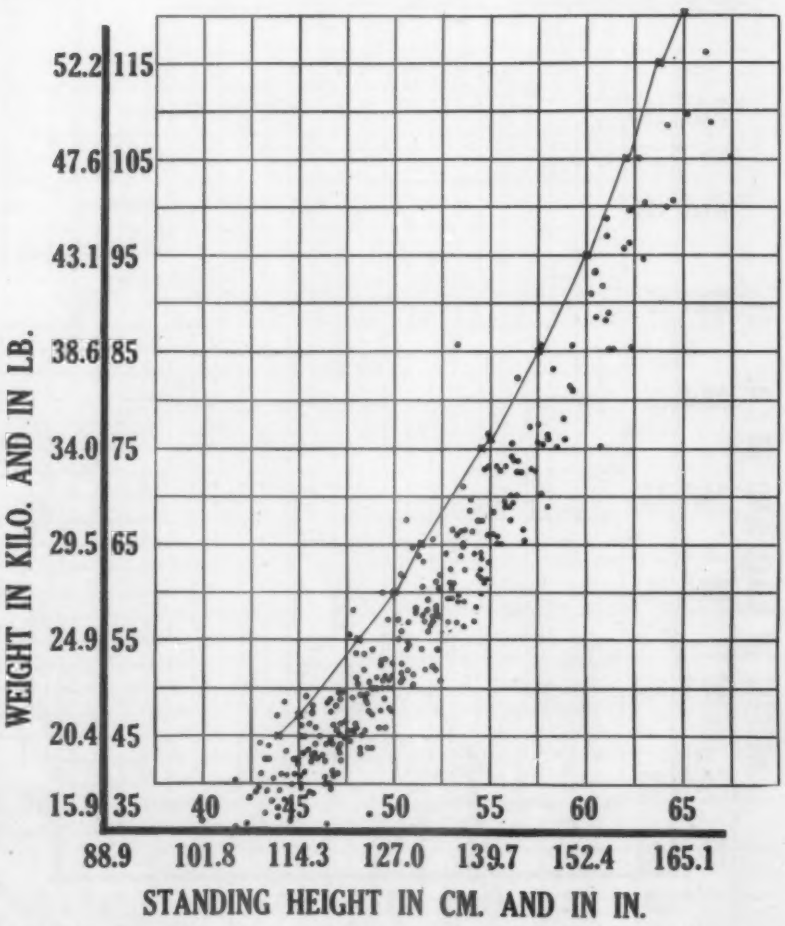

Chart 9.—Growth curves in standing height and weight. Boys in summer school indicated by period; American boys, according to Baldwin's method, indicated by star.

the vegetables, about 5 gm. to each person daily. These amounts, being very small, and the material being added to the general dishes at large, it could be recorded only in this way, that is, by taking the amount per day used throughout the school and dividing by the number of individuals. This will show a slightly less fat intake for the older boys and

a slightly increased fat intake for the younger boys than that which really occurred, but the discrepancy will be small and will be corrected in the general average. The foods used, and their analyses will be found in Table 1.

Certain other data concerning the food must be added:

One mantou, weighing 32 gm., contains 15 gm. of white flour. (A mantou is a small square of Chinese steamed bread.)

One bowl of millet chow, medium consistency, contains 25 gm. of dry millet and 375 gm. of water.

One bowl of eggplant, raw, contains 100 gm. raw vegetable, which weighs 120 gm. after boiling.

One corn meal mantou, weighing 102 gm., contains 44.5 gm. of corn meal.

One bowl of corn meal chow contains 40 gm. of dry corn meal and 375 gm. of water (chow of medium consistency).

One bowl of white pumpkin contains 150 gm. of the vegetable weighed fresh (edible portion), or 160 gm. weighed after boiling.

TABLE 1.—*Analysis of the Foods Used*

	Protein	Fat	Carbohydrate	
Eggplant	1.2	0.3	5.1	S.*
Chinese turnip	0.63	0.01	5.62	W.
Millet	9.2	0.2	76.6	W.
Pumpkin	1.0	0.1	5.2	S.
Wheat (entire)	13.8	1.9	71.9	S.
Corn meal	9.2	1.9	75.4	S.
Green cabbage	1.6	0.3	5.6	S.
Pork (average ribs, shoulders, and side)	13.2	43.2	...	S.

* S denotes analyses taken from Sherman's tables in "Chemistry of Food and Nutrition," (second edition); W denotes analyses made in the laboratory of Dr. Hsien Wu, Peking Union Medical College.

Average Diet of Six Poor School Children, Aged 8 Years.—As we have already said, nine children of various ages were observed the entire day, and these observations were checked up by observations on twenty-seven different children of corresponding ages; one set of nine for breakfast, another totally different set for dinner, and a third for supper, so that the average of each meal might be determined. These averages correspond to a remarkable degree with the known daily food intake of the individual cases.

Each child of 8 years takes two corn meal mantous, one bowl of millet gruel and 10 gm. of salt vegetable for breakfast; four wheat bread mantous and one bowl of cooked vegetables for dinner; two corn meal mantous, one bowl of corn meal gruel, and 10 gm. of salt vegetable for supper. To this is added 5 c.c. of oil in the cooking of the vegetables along with 5 gm. of pork, of which we have already spoken. This diet contains about 900 calories, as the diet chart will show, which are divided about as follows: Fat, from 13 to 14 per cent.; carbohydrate, from 74 to 75 per cent. and protein, from 11 to 12 per cent.

Average Diet of Six Poor School Children, Aged 12 Years.—The breakfast is the same. The dinner contains two more mantous. The

supper is the same. This diet contains slightly under 1,000 calories and its percentages are as follows: Fat, from about 12 to 13 per cent.; carbohydrate, from 75 to 76 per cent. and protein, about 12 per cent.

Average Diet of Six Poor School Children, Aged 16 Years.—Four corn meal mantous, 20 grams of salt vegetable, and two bowls of millet

TABLE 2.—*Diet Chart*

No.	Age (Chinese)	Body Wt., Kg.	Sitting Height, Cm.	Total Weight of Intake in Grams: Fats	Carbohydrates	Proteins	Caloric Value: Fats	Carbohydrates	Proteins	Total	Calories per Kg. of Body Weight: Chinese	American
1	8	17.37	63.9	12.47	157.02	24.21	115.97 13.5%	643.78 74.9%	99.26 11.6%	859.01	49.4	80
2	8	20.22	65.1	12.67	161.85	25.15	117.88 13.4%	663.59 75.0%	103.12 11.6%	884.54	43.7	80
3	8	17.95	63.2	12.75	166.06	26.00	118.58 13.1%	680.85 75.1%	106.60 11.8%	906.03	50.5	80
4	12	22.73	71.4	13.19	182.18	29.16	122.67 12.4%	746.94 75.5%	119.56 12.1%	989.17	43.5	80
5	12	24.55	69.9	13.18	183.55	28.77	122.57 12.4%	752.56 75.7%	117.96 11.9%	993.04	40.5	80
6	12	21.14	67.0	12.84	170.03	26.79	119.41 12.9%	697.09 75.2%	109.84 11.9%	926.33	43.8	80
7	16	35.00	73.5	15.79	302.26	47.74	146.85 9.3%	1239.27 78.2%	198.73 12.5%	1584.85	45.3	80
8	16	31.37	73.4	16.57	331.13	53.05	154.10 8.9%	1357.94 78.5%	217.51 12.6%	1729.45	55.1	80
9	16	36.14	81.2	17.36	364.31	60.29	161.45 8.5%	1493.67 78.5%	247.19 13.0%	1902.31	52.7	80
Average percentage.....							11.6	76.3	12.1		47.2	

TABLE 3.—*Diet Chart*

Age, (Chinese)	Total Weight of Intake in Grams: Fats	Carbohydrates	Proteins	Caloric Value: Fats	Carbohydrates	Proteins	Total	Fats, %	Carbohydrates, %	Proteins, %
8	12.82	173.20	26.31	119.23	710.12	107.87	937.22	12.7	75.8	11.5
8	12.65	166.44	25.10	117.75	682.40	102.91	903.06	13.0	75.6	11.4
8	12.71	169.13	25.69	118.20	693.63	105.33	917.16	12.9	75.6	11.5
12	13.24	188.95	30.09	123.13	774.70	123.37	1020.20	12.0	75.9	12.1
12	13.30	192.40	30.07	123.69	788.84	123.29	1035.82	11.9	76.2	11.9
12	13.42	195.88	30.80	124.81	803.11	126.28	1054.20	11.8	76.2	12.0
16	16.93	351.61	53.63	157.45	1441.60	228.98	1828.03	8.6	78.9	12.5
16	17.74	381.91	59.77	164.98	1565.83	245.06	1975.87	8.4	79.2	12.4
16	17.76	392.65	60.32	165.17	1609.87	247.31	2018.37	8.2	79.6	12.2
Average.....								11.0	77.0	12.0

gruel for breakfast; twelve wheat bread mantous and two bowls of cooked vegetable for dinner; six corn meal mantous, two bowls of corn meal gruel, and 20 grams of salt vegetable for supper.

Twelve wheat bread mantous make up a large bulk. This is three times the amount eaten by the children 8 years of age, and twice the amount eaten by the children 12 years of age, but it is a phenomenon actually observed by us to be a fact.

This diet contains about 1,700 calories, which are divided as follows: Fat, from 8 to 9 per cent.; carbohydrate, 78 per cent. and protein, from 12 to 13 per cent.

From the before-mentioned ages, of course, 1½ years must be subtracted.

It may also be noted that the salt vegetable used was Chinese turnip, and that eggplant and pumpkin were used cooked.

TABLE 4.—*A Comparison of Food Intake of Chinese and American Children*

	8 Years			12 Years			16 Years		
	Fats	Carbohydrates	Proteins	Fats	Carbohydrates	Proteins	Fats	Carbohydrates	Proteins
Chinese.....	12.6	161.3	25.1	13.1	178.5	28.2	16.5	332.5	58.6
	6 Years			10 Years			14 Years		
	Fats	Carbohydrates	Proteins	Fats	Carbohydrates	Proteins	Fats	Carbohydrates	Proteins
American.....	60.3	195.2	58.5	87.7	284.0	85.5	128.0	414.8	125.0

Table 5 may be of interest as it shows the cost of the foods used.

TABLE 5.—*The Costs of Foods Used* *

Allowing 598.4 grams = 1 catty.

	1 Catty Costs	1 Gram Costs
Egg plant	6 coppers	0.010 coppers
Chinese turnip, salt	6 coppers	0.010 coppers
Millet	18 coppers	0.030 coppers
Pumpkin	6 coppers	0.010 coppers
Wheat	26 coppers	0.043 coppers
Cornmeal	15 coppers	0.025 coppers
Green cabbage	8 coppers	0.013 coppers
Pork	46 coppers	0.077 coppers
Sesame oil	77 coppers	0.128 coppers

* This table was compiled by Miss Helen Lynch, assistant dietitian at Peking University Medical College, whose assistance in this and in many other ways is highly appreciated.

A rough calculation based on Table 6 gives the following result:

TABLE 6.—*Cost Sheet* *

	Cost of Each Child per Day	Per Month
8 years old	11.005 coppers	330.15 coppers or $1.22 Mex.*
12 years old	12.295 coppers	368.85 coppers or 1.36 Mex.
16 years old	25.79 coppers	773.70 coppers or 2.86 Mex.

* The exchange varies a great deal. It is usually higher but the rate when this paper was written (Feb. 11, 1925) was $179.00, that is, $1.00 gold would buy $1.79 Mex.

Table 2 shows the actual diet of nine children along with their weights, sitting heights, and an estimate of the percentages of the caloric value of fat, carbohydrate and protein; the number of calories per kilogram of body weight, and a comparison with the number of calories per kilogram of body weight required for American boys as recom-

4. Holt, L. Emmett, and Fales, Helen L.: The Food Requirements of Children, Am. J. Dis. Child. **21**:1 (Jan.) 1921.

mended by Holt.[4] Table 3 comprises twenty-seven meals of twenty-seven different children, making up in all total food intakes for nine imaginary individuals of ages corresponding to Table 1. This table checks up Table 2 to an extraordinary degree, and of course is valuable only for that purpose. The results of these charts may be summarized as follows: The caloric intake of these children is only about one-half that of American children of corresponding age, and the number of calories per kilogram of body weight is but slightly over one-half. The protein intake is moderately low, the fat intake very low, and the carbohydrate intake correspondingly high. Table 4 is a comparison of the fat, carbohydrate, and protein intake of Chinese and American children in grams, according to Holt.[5]

CONCLUSION

It seems to us that the summaries of these observations must speak for themselves. The children of this school are living a happy, useful life, working hard and playing actively. Their food intake is distinctly low, as compared with American standards. Their diet will seem to many to be monotonous, being no change except occasional substitution of vegetables in season, which are of the same quality as those before mentioned and which are used in equal amounts. No milk, butter, eggs, and practically no fruit are used, all of which are considered of high value in our diets. It is suggested that the explanation of these conditions lies in the relation between food supply and population. We have here, apparently, a large population which must be rationed in the most economical manner. To anyone traveling in North China, it is evident that the most strenuous efforts, whether effective or ineffective, are being maintained to produce food for the people. We believe that it is possible that the Chinese have developed a diet, in an evolutionary manner, which embodies great economy, and which gives a maximum result for a minimum intake. The low protein intake may also be of significance, because it is but little over one-half of that reported by Holt,[5] whose figures were obtained by allowing 2.6 gm. of protein per kilogram body weight. At present we can but call attention to this striking difference.

The measurement charts suggested also that a very real difference exists between the Chinese "normal" and the American "normal." Not only are Chinese children in this neighborhood (Peking) under the normal American height and weight but even under the weight for height ratio. They seem to have "cleared for action," to have trimmed themselves down to a physique suitable to the economic environment.

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5. Holt, L. Emmett, and Fales, Helen L.: The Food Requirements of Children, Am. J. Dis. Child. **22**:371 (Oct.) 1921.

THE DUODENAL CONTENTS OF INFANTS IN HEALTH, AND DURING AND FOLLOWING DIARRHEA

PRELIMINARY REPORT *

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In this study of the relation between the results of analyses of duodenal contents and the state of digestion, I have determined the hydrogen ion concentration and the amylase and the trypsin activity, and have made aerobic cultures of 50 specimens of duodenal contents obtained from twenty-five infants. Six of these infants were normal, eight were convalescent from diarrhea (one of these died as a result of pneumonia), six died of diarrhea and five succumbed to bacillary dysentery (Flexner). By the term diarrhea, I refer to all types of infantile diarrhea, except bacillary dysentery. Diarrhea and dysentery can be readily distinguished on clinical as well as on bacteriologic grounds.[1] The patients who died as a result of diarrhea had been losing weight and had had frequent loose, watery stools. Those who were convalescent from diarrhea were gaining weight slowly and had from two to eight semiformed stools daily.

METHODS

The duodenal specimens from the normal infants and from those convalescent from diarrhea were obtained by means of a modified Jutte duodenal tube. The ordinary Jutte[2] tube consists of a cylindric solid brass tip, 1.5 cm. long and 0.4 cm. in external diameter, attached to 100 cm. of rubber tubing of the same external diameter containing a wire obturator. The 10 cm. of rubber tubing nearest to the brass tip contains a series of perforations. I have modified this tube by having two holes, 0.2 cm. in diameter, bored through the brass tip, one longitudinally and the other transversely. I have also cut off the perforated portion of the rubber tubing and have attached the tip to the unperforated remainder. This modification was necessary because I found that, although the solid tip of the original Jutte tube readily passed the

* Received for publication, March 26, 1925.

* From the Department of Pediatrics, Johns Hopkins University and the Harriet Lane Home, Johns Hopkins Hospital.

1. Davison, W. C.: A Bacteriological and Clinical Consideration of Bacillary Dysentery in Adults and Children, Medicine **1**:389-510; The Bacteriology of Diarrhea in Infants, South M. J. **17**:552-560 (Aug.) 1924.

2. Jutte, M. E.: Technic of Transduodenal Lavage in Office Practice with or without Oxygen Insufflation, M. Rec. **92**:499-502 (Sept. 22) 1917.

pylorus, a sufficient length of the perforated portion of the tubing remained in the stomach to permit the withdrawal of gastric as well as of duodenal contents. I have discarded the obturator. An ordinary soft rubber catheter, size 12 (French) is often recommended as a satisfactory duodenal tube for infants but I have found that, in addition to being difficult to locate with a fluoroscope, the soft tip does not pass the pylorus as readily as a metal one. Possibly the hard metal stimulates gastric contractions which facilitate passage into the duodenum.

I usually pass the tip and from 20 to 30 cm. of the tube, after it has been boiled, into the infant's stomach through one of the nostrils and then fasten the remainder of the tubing to the nose with adhesive tape. A knot should be tied temporarily in the proximal end of the tubing to prevent leakage. From fifteen to thirty minutes later, the position of the tip is ascertained by means of a fluoroscope. If the tip is in the duodenum, the duodenal contents are aspirated with a sterile Luer syringe attached to the proximal end of the tubing. As rarely more than a few tenths of 1 c.c. of duodenal contents can be obtained at a single aspiration, this procedure must be repeated three or four times per minute for several minutes. The first cubic centimeter of the specimen should be discarded as it contains gastric contents. If the infant is restrained, the proximal end of the duodenal tube can be attached to a long rubber tube of the same diameter which leads to a test tube fastened to the leg of the bed. In this way, much larger amounts of the duodenal contents can be collected. A normal infant can apparently secrete more than 25 c.c. of duodenal material per hour. The tube may be left in situ for several hours and additional specimens may be collected after various intervals.

On fluoroscopic examination, if it is found that the metal tip is not in the duodenum, the tube should be withdrawn a few centimeters and then reinserted while the infant is on the fluoroscope table. By rolling the tube between the fingers and at the same time withdrawing or reinserting it, the tip usually can be manipulated through the pylorus within a few minutes. Specimens of the duodenal contents are then obtained in the manner described. I was much interested in reports of knots that may become tied in duodenal tubes;[3] with the fluoroscope I have seen a knot form in the tubing in the stomach, then by manipulation I have succeeded in untying it without totally withdrawing the tube. This duodenal tube does not produce any discomfort to the patient, although

3. Billings, F. T.: Knotting of Duodenal Tube in Situ, J. A. M. A. **80**:1774-1775 (June 16) 1923; Boles, R. S.: Knotting of Duodenal Tube During Biliary Drainage, ibid, **82**: 303 (Jan. 26) 1924; Niles, G. M.: Knotting of Duodenal Tube During Biliary Drainage, ibid., **82**: 967 (March) 1924.

it is usually necessary to restrain the hands to prevent the tube from being dislodged. After the tubing had been fastened to the nose with adhesive tape, all of the infants took their bottle feedings by mouth and appeared to be quite happy.

The duodenal contents of the infants who died were obtained as aseptically as possible at necropsy within from two and one half to twenty-nine hours after death. The mean value for the number of hours after death at which the specimens were obtained was nine hours. The bodies were all placed in the morgue, at a temperature of 4 C., within a half-hour after death and kept there until the necropsy was performed. The number of hours which had elapsed between death and necropsy had no apparent relation to the values obtained in the analyses of these specimens.

From 2 to 5 c.c. of clear yellow duodenal contents was usually obtained after a series of aspirations or at necropsy. Cultures were made by streaking one loopful of the material on plates of blood agar and Teague's medium. The specimen was then centrifuged in a sterile centrifuge tube to remove any lumps of undigested food that were present.

The hydrogen ion concentration was determined colorometrically[4] by placing 0.1 c.c. of the specimen in each of two tubes containing 3 c.c. of distilled water and the proper amount of indicator. The color in one of these tubes was compared with that of the standard tubes. The other tube was used as a blank and placed behind the standard tube in the comparator block so that any trace of bile color was thereby controlled. The determinations obtained by comparing the color of tubes containing 0.2, 0.3, 0.5 and 1.0 c.c. of the specimen in 3.0 c.c. of distilled water were practically always within one tenth of a p_H of that determined with 0.1 c.c. of the specimen, so that although the hydrogen ion values obtained by this method were not exactly correct, yet they were sufficiently accurate for comparative purposes.

The trypsin values were obtained by the method of Northrop and Hussey,[5] by which it is possible to determine accurately the rate at which from 0.05 to 0.2 c.c. of the duodenal contents will reduce, at 34 C., the initial viscosity of 3 per cent. gelatin at p_H 7.4. The method of calculating the number of trypsin units per cubic centimeter of duodenal contents has been described elsewhere.[6]

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4. Clark, W. M.: The Determination of Hydrogen Ions, Baltimore, Williams & Wilkins Co., 1920, pp. 417.

5. Northrop, J. H., and Hussey, R. G.: A Method for the Quantitative Determination of Trypsin and Pepsin, J. Gen. Physiol. **5**: 353 (Jan.) 1923.

6. Davison, W. C.: A Viscometric Method for the Quantitative Determination of Amylase, Bull. Johns Hopkins Hosp. (in press).

The amylase values were determined by a viscometric method[6] similar to that for trypsin, in which a 2 per cent.[7] solution of soluble starch (Lintner) at p_H 5.6 was employed as a substrate instead of 3 per cent. gelatin. The number of amylase units per cubic centimeter of duodenal contents was calculated as described elsewhere.[6] The optimum hydrogen ion concentration for the action of duodenal amylase of infants is about p_H 7.0,[8] but the enzyme was sufficiently active at p_H 5.6 for satisfactory determinations to be made. Both the trypsin and amylase determinations were made in duplicate.

TABLE 1.—*Relation of the Results of Duodenal Analyses to the State of Digestion in Infants*

State of Digestion of the Infants	No. of Specimens	No. of Patients	p_H of Duodenal Contents		Units of Amylase per C.c. of Duodenal Contents		Units of Trypsin per C.c. of Duodenal Contents		Duodenal Cultures	
			Mean	Extremes	Mean	Extremes	Mean	Extremes	Per Cent. of Patients Having Mixed Flora or Sterile Cultures	Per Cent. of Patients Having Heavy Growth of B. coli
Normal.....	23 (duodenal tube)	6	6.2	(5.2 to 7.6)	17.1	(7.6 to 59.9)	[illegible]	(31.2 to 165.8)	100	0
Convalescent from diarrhea	16 (15 duodenal tube, 1 necropsy)	8	6.0	(3.3 to 7.7)	19.5	(15 to 54.9)	30.7	(5.2 to 58.3)	100	0
Diarrhea.....	6 (necropsy)	6	5.3	(4.5 to 6.2)	*	(0 to 15.8)	3.2	(* to 52)	17	83
Bacillary dysentery (Flexner)	5 (necropsy)	5	5.1	(4.8 to 5.8)	11.6	(* to 16)	10.3	(* to 18.2)	100	0

* Indicates less than 1 unit per c.c. of duodenal contents.

RESULTS

In Table 1 the relation of the results of these duodenal analyses to the state of the infants' digestion has been summarized. It is apparent that although widely divergent extremes in the hydrogen ion concentration and in the activity of amylase and trypsin were present within each of the four groups, yet the mean values of these determinations in the patients suffering from diarrhea and dysentery differed strikingly from those obtained in normal infants and in patients convalescent from diarrhea. The results of individual determinations made at different times on the

7. In other experiments, in which a different lot of Lintner starch was used, from 5 to 6 per cent. of starch was necessary to produce a solution of desirable viscosity, that is, twice that of water. The viscosity of solutions made with some lots of Lintner starch is unstable and decreases progressively at 34 C.[8] Starch solutions of stable viscosity are the only ones which can be used for viscometric determinations.

8. Widener, D. C., and Rothman, P. E.: The Optimum Reaction for the Duodenal Amylase of Infants (in press).

same patient varied widely, so that the mean values are the only ones on which much reliance can be placed. Some of the factors responsible for these variations will be discussed later.

The increased acidity of the duodenal contents of the infants who died as a result of diarrhea or dysentery may have been caused by their diets of protein milk, but for reasons which will be advanced later, it is just as likely that is was due to a failure on the part of the duodenum to secrete alkali.

The great reduction of enzymatic strength in patients who died as a result of diarrhea or dysentery apparently indicates that in these conditions, especially in the former, there was a physiologic failure or pancreatic and duodenal secretion. As the effect of the dysenteric infection itself is probably the more important cause of death in bacillary dysentery and the digestive disturbance only a secondary factor, it is logical that the reduction in enzyme content should be less in dysentery than in diarrhea. This reduction in amylase and trypsin in the duodenal contents of infants suffering from digestive disturbances is comparable to the diminution of duodenal lipase recently reported by Greiner[9] in similar conditions.

One should, of course, hesitate to attach much importance to a comparison of the enzymatic activity of necropsy specimens with that of antemortem material. The critical condition of the patients suffering from severe diarrhea made the passage of a duodenal tube inadvisable, even though it is a harmless procedure. It is improbable, however, that death and necropsy changes alone were responsible for all of the enzymatic reduction noted in the specimens obtained from these infants who died as a result of diarrhea or of dysentery, for a much greater reduction was found in the diarrhea than in the dysentery group, yet the specimens from both groups were obtained under identical conditions. Furthermore, the enzymatic activity of duodenal contents kept for several days on ice did not appreciably diminish. The enzyme strength of the postmortem specimen of the duodenal contents of one infant convalescent from diarrhea (but who died as a result of pneumonia) was higher than the mean values found in the antemortem specimens of the other convalescent infants. The analyses of the antemortem material obtained from normal infants and from those convalescent from diarrhea demonstrates a marked reduction in trypsin strength in the latter group.

It has been reported[10] that the protein and fat content of loose diarrheal stools is from two to three times that of normal stools. It is

9. Greiner, I.: Untersuchung von fettspaltende Fermenten in Duodenalsaft der Säuglinge, Jahrb. f. Kinderh. **103**:211-216 (Nov.) 1923,

10. Holt, L. E.; Courtney, A. M., and Fales, H. L.: The Chemical Composition of Diarrheal as Compared with Normal Stools, Am. J. Dis. Child. **9**:213-224 (March) 1915.

possible that this decrease in digestion and absorption may have been due, in part, to the diminution in duodenal enzymes; but an increased secretion of mucus, as well as the rapid progress of the food through the intestines, which results from increased peristalsis, must, of course, also be considered as factors.

TABLE 2.—*Relation of the Types of Organisms Found in Duodenal Cultures to the State of Digestion in Infants*

State of Digestion of the Infants	No. of Specimens	No. of Patients	Percentage of Specimens in Each Group Containing the Following Organisms (Aerobic Cultures)										
			No Growth (Sterile)	Colon Group	Streptococci	Staphylococci	Aciduric Bacilli	Spore Bearing Bacilli	Enteritidis Group	Gram-negative cocci	B. proteus	Yeasts	B. pyocyaneous
Normal.....	25 (duodenal tube)	6	35	30	30	42.5	4	0	0	0	4	4	0
Convalescent from diarrhea	16 (15 duodenal tube, 1 necropsy)	8	6	50	50	25	12.5	0	0	25	0	37.5	6
Diarrhea.....	6 (necropsy)	6	0	100*	0	17	17	0	17	0	0	0	0
Bacillary..... dysentery (Flexner)	5 (necropsy)	5	0	60	40	0	0	20	0	0	0	20	0

* In the duodenal cultures of five of the six patients (83 per cent.) the growth of B. coli was heavy.

More than one third of the duodenal specimens from the normal infants and one from those convalescent from diarrhea were sterile but those of the others contained a variety of organisms (Table 2). Except in the patients who died as a result of diarrhea, these organisms were present in comparatively small numbers, only from 10 to 100 colonies of any one variety on a plate made from one loopful of the duodenal contents. In the duodenal cultures of five of the six infants who died as a result of diarrhea, however, there was a heavy growth of *B. coli*. In fact, in the duodenal cultures of patients suffering from or convalescent from diarrhea, colon bacilli were much more numerous than in the cultures of normal infants. These observations, which are similar to those of Moro [11] and Bessau,[12] would seem to indicate a

11. Moro, E.: Morphologische und biologische Untersuchungen über die Darmbakterien des Säuglings, Jahrb. f. Kinderh. **61**:687-734, and **62**:467-478, 1905; Die Verteilung und die Schicksale der normalen Bakterien im Säuglingsdarm, ibid. **61**:870-899, 1905; Ueber enterale Infektion bei Säuglingen, Monatschr. f. Kinderh. **22**:273-279 (Nov.) 1922.

12. Bessau, G., and Bossert, O.: Zur Pathogenese der akuten Ernährungsstörungen, I. Mitteilung. Bakteriologie des Magens u. Duodenums; II. Dyspepsien, Jahrb. f. Kinderh. **89**: 213-238, 269-323, 1919. Bessau, G.: Ueber enterale Infektion, Monatschr. f. Kinderh. **22**:280-295 (Nov.) 1922.

relationship between the duodenal implantation of these organisms and digestive disturbances. The most probable explanation for the large numbers of colon bacilli in the duodenal contents of infants suffering from diarrhea, is that as a result of the reduction in the amount of enzymes, undigested or unabsorbed food accumulates in the duodenum and furnishes an excellent culture medium for these organisms which ascend from the cecum and from the large intestine. Moro [11] and Bessau [12] have reported that as a result of almost every digestive disturbance in infants, the contents of the upper intestine increase in amount, become more fluid in character, richer in food material and hence make an excellent culture medium. It is quite possible that the irritation of the mucosa of the upper intestine by the end-products of the growth of *B. coli* is responsible for the increased peristalsis of diarrhea. Experiments on dogs [13] have apparently demonstrated that repeated small doses of some of these end-products can accomplish this result. The action of these end-products is probably in the nature of a chemical irritation rather than a bacterial inflammation and thus the absence of postmortem lesions may possibly be explained.

That a lack of duodenal enzymes may perhaps be responsible for diarrhea is suggested by the fact that the depancreatized dogs which Allan and his co-workers [14] endeavored to keep alive with insulin died with symptoms of diarrhea, from two to seven months after their pancreases had been removed. The dogs could not be fed polysaccharids without producing diarrhea and there was evidence of failure of fat and protein absorption. It is possible that the diarrhea may have been owing, in part, to the lack of pancreatic enzymes in the duodenum. A depancreatized dog which was fed raw pancreas for three months had no diarrheal symptoms.

Aciduric bacilli (*B. acidophilus, B. bifidus* and *B. bulgaricus*) were more frequently encountered in the duodenal cultures of patients dying from or convalescent from diarrhea than in the cultures of normal infants and of those dying as a result of dysentery. This observation would seem to refute the statement of Cheplin [15] that digestive dis-

13. Bahrdt, H., and Bamberg, K.: Untersuchungen über die Pathogenese der Verdauungsstören in Säuglingsalter. IV. Mitteilung, Tierversuche über die Wirkung niederer organischer Säuren auf die Peristaltik vom Duodenum aus und bei wiederholter Fütterung, Ztschr. f. Kinderh. **3**:350-365, 1912.

14. Allan, F. M.; Bowie, D. J.; MacLeod, J. G. R., and Robinson, W. L.: Behavior of Depancreatized Dogs, Kept Alive with Insulin, Brit. J. Exper. Path. **5**:75-83 (April) 1924.

15. Cheplin, H. A., and Rettger, L. F.: Bacillus Acidophilus and Its Therapeutic Application, Arch. Int. Med. **29**:357-367 (March) 1922. Cheplin, H. A.; Fulmer, H. C., and Barney, C. O.: Therapeutic Application of Bacillus Acidophilus Milk, J. A. M. A. **80**:1896 (June 30) 1923.

turbances are associated with the absence of *B. acidophilus* from the intestinal flora and to confirm studies previously made in this hospital.[1]

This increase cannot altogether be due to the bacilli of the bulgaricus group in the protein milk, which most of the infants in the diarrheal group received, for all of the dysentery patients were also fed protein milk and yet had no aciduric bacilli in their duodenal cultures.

In adults, Boardman [16] has reported that the organisms found in duodenal cultures are usually of the same varieties as those which can be demonstrated in cultures from the mouth, and are therefore the result of swallowed saliva. As the varieties of cocci which I have found in the duodenal cultures of infants are similar to those reported by Boardman, the same conclusion can probably be drawn in regard to their origin. The absence of streptococci from the duodenal cultures of the infants who died as a result of diarrhea possibly was due to the fact that the colon bacilli were so numerous that the streptococci were overgrown.

TABLE 3.—*Relation of the Clinical Condition to the Results of Duodenal Analyses in a Patient Suffering from Chronic Intestinal Indigestion (Celiac Disease)*

Clinical Condition	Date of Analysis	Diet	p_H of Duodenal Contents	Units of Amylase per C.c. of Duodenal Contents	Units of Trypsin per C.c. of Duodenal Contents	Duodenal Cultures
Typical chronic intestinal indigestion. Large stools, distended abdomen, irritability, stationary weight	12/5/23	Protein milk, junket	6.7	15	22.7	Mixed flora
Improvement, stools more nearly normal, abdomen less distended, cheerful, gaining in weight	2/11/24	Buttermilk, junket, eggs, scraped beef	6.9	54.9	30.9	Mixed flora

That the enzyme content of the duodenum may bear some relation to the state of digestion is suggested by the results tabulated in Table 3. An increase in the amylase and the trypsin strength of the duodenal contents of the patient was noted after marked clinical improvement in her digestion. Whether this increase was a coincidence or was one of the causes of her improvement it is impossible to state.

In another patient (J. C., Table 4), a reduction in enzymatic strength was noted during a mild digestive disturbance, characterized by softer and more pasty stools, occasional vomiting and refusal of food. This digestive disturbance, which was apparently precipitated by a febrile infection of the middle ear, was so transitory that it did not justify the removal of the infant from the normal group, yet his state of digestion

16. Boardman, W. W.: A Study of the Bacteriological Findings in the Lyon Meltzer Test, Am. J. M. Sc. **167**:847-851 (June) 1924.

was distinctly worse than when the first analysis was made. The fact that the duodenal contents were sterile may possibly explain the absence of diarrhea, for though the character of the stools changed they did not become more numerous.

TABLE 4.—*Relation of Diet and Age to the Results of Duodenal Analyses in Infants Having Normal Digestion*

Diet	Name of Infant	Age in Months	No. of Analyses and (Date)	p_H of Duodenal Contents (Mean Value)	Units of Amylase per C.c. of Duodenal Contents (Mean Value)	Units of Trypsin per C.c. of Duodenal Contents (Mean Value)	Duodenal Cultures
Diluted sweet milk + 5% sugar	W. R.	6½	2 (12/21/23)	6.3	9.7	65.5	Sterile
Diluted sweet milk + 5% sugar	C. M.	6½	1 (8/6/23)	5.6	7.6	79.5	Mixed flora
Undiluted sweet milk.....	M. B.	42	3 (2/13/24)	5.2	14.3	97.0	Mixed flora
Diluted whole lactic acid milk* + 5% dextrimaltose	W. R.	8	3 (2/7/24)	6.1	15.1	88.0	Mixed flora
Diluted whole lactic acid milk + 5% dextrimaltose	J. C.	7½	2 (1/16/24)	6.2	59.9	132.0	Mixed flora
Diluted whole lactic acid milk + 5% dextrimaltose	J. C.	8½	2 (2/9/24)	7.3	47.2	67.8	Sterile
Protein milk† + 5% dextrimaltose, and farina	M. J.	6	3 (11/19/24)	6.2	14.3	165.8	Mixed flora
Protein milk + 5% dextrimaltose, and farina	E. C.	11	3 (11/ 1/23)	5.5	19.1	62.3	Mixed flora
Protein milk + 5% dextrimaltose, and farina	E. C.	12	2 (11/26/24)	6.3	30.0	31.2	Mixed flora
Protein milk + 5% dextrimaltose, and farina	E. C.	12	2 (12/ 3/24)	7.6	26.4	69.0	Mixed flora

* The whole lactic acid milk was made by adding 8.0 c.c. of lactic acid (U. S. P.) to 1 quart of whole milk (p_H 4.0[18]).

† The protein milk was made by emulsifying the curd from 1 quart of whole milk in 1 quart of skimmed buttermilk (p_H 5.0, Kramer, B., and Greene, C. H.: J. Biol. Chem. **46**: 42, 1921.

FACTORS WHICH AFFECT THE RESULTS OF DUODENAL ANALYSES

Diet.—So far as can be judged from Table 4, the only influence that diet had on the results of the duodenal analyses was that lactic acid milk and sugar possibly stimulated the secretion of amylase in normal infants. Similar observations were made in the infants who were convalescent from diarrhea. Diet had no apparent effect on the hydrogen ion concentration of the duodenal contents of normal infants (Table 4), nor on

TABLE 5.—*Relation of Diet and the Hydrogen Ion Concentration of the Duodenal Contents of Infants Regardless of the State of Their Digestion*

Diet	No. of Specimens	Hydrogen Ion Concentration of Duodenal Contents Obtained from Infants on Various Diets	
		Mean Value	Extremes
Sweet milk (p_H 6.7).....	8	p_H 5.5	p_H 5.0-6.5
Protein milk (p_H 5.0).....	25	p_H 5.8	p_H 3.3-7.7
Whole lactic acid milk (p_H 4.0) and buttermilk (p_H 4.7)..	10	p_H 6.4	p_H 5.8-7.4

those convalescent from diarrhea. However, when the data were arranged according to the diets of the infants, regardless of the state of their digestion (Table 5), it was found that the mean value of the acidity of the duodenal contents was inversely proportional to the acidity of the diet. At first glance, it would appear that the acidity of the diet stimulated a duodenal secretion of alkali, but as may be seen in Table 6 this first impression is probably erroneous.

TABLE 6.—*Relation of Diet and the Hydrogen Ion Concentration of the Duodenal Contents of Infants Regardless of the State of Their Digestion*

Hydrogen Ion Concentration of the Duodenal Contents	No. of Specimens	Percentage of Specimens in Each Group Obtained from Infants on the Following Diets		
		Sweet Milk (p_H 6.7)	Protein Milk (p_H 5.0)	Whole Lactic Acid Milk (p_H 4.0) and Buttermilk (p_H 4.7)
p_H 3.3–4.8	9	0	100	0
p_H 5.0–5.8	10	50	40	10
p_H 6.1–6.5	13	23	38	39
p_H 7.0–7.7	11	0	64	36

When the data were arranged according to the hydrogen ion concentration of the duodenal contents, it was noted that all of the most acid specimens and nearly two thirds of those most alkaline were obtained from infants fed protein milk. The reaction of protein milk, therefore, could not have been responsible alone for the reaction of the duodenal contents. The hydrogen ion concentration of the duodenal contents of infants fed with sweet milk varied only from p_H 5.0 to 6.5, while that of infants fed some form of lactic acid milk varied from p_H 3.3 to 7.7. Contrary to former belief, the duodenal contents of infants are practically always acid instead of alkaline. The only data which suggested that the acidity of the diet stimulated a duodenal secretion of alkali were that more than one third of the specimens with a reaction from p_H 6.1 to 7.7 were obtained from infants fed a very acid diet, namely, whole lactic acid milk or buttermilk. In view of these conflicting data, it is probable that the reaction of the diet had no relation to the reaction of the duodenal contents.

Diet had no apparent effect on the types of organisms found in the duodenal cultures of normal infants (Table 4). A few colon bacilli were found in several of the cultures from the normal infants on all three of the diets. The fact that there were actually more organisms in the cultures of the duodenal contents of infants who were fed protein milk and lactic acid milk would seem to refute those who ascribe the benefits derived from these diets to their antiseptic action. It is possible that these diets, instead of being antiseptic, constitute a medium unfavorable for bacterial growth and consequently, that an excessive proliferation of bacteria in the duodenum may be prevented. As a result

of this bacteriostatic action, the fermentation of undigested and unabsorbed food and the formation of irritating end-products by organisms in the duodenum may be inhibited.

Age.—With the exception that the necropsy duodenal contents of two infants (who died at the ages of 4 and 14 days, respectively), not included in these series, contained no amylase, age had no apparent relation to the results of duodenal analyses.

Time After Last Feeding, at Which the Specimens Were Obtained.—There was a gradual reduction after meals in the acidity of the duodenal contents of normal infants and of those convalescent from diarrhea, from a mean value of p_H 5.4 within one hour after meals to a mean value of p_H 7.0, ten hours later. The time which elapsed after a meal had no definite relation to the amount of enzymes secreted by normal infants and by those convalescent from diarrhea, with the possible exception that the amount of amylase decreased slightly and that the amount of trypsin increased up to six or eight hours after a meal and then decreased very slightly. The data which suggested these two observations were not very convincing. In the infants who died as a result of diarrhea or of dysentery only single observations were made, so no conclusions can be drawn in regard to the effect of the time which elapsed after a meal on the results of the duodenal analyses.

HYDROGEN ION CONCENTRATION OF THE DUODENAL CONTENTS

As a general rule to which there were many exceptions, in the normal infants and in those convalescent from diarrhea, the less acid the duodenal contents, the greater was the enzymatic activity. This relationship probably does not depend on the injurious effect of the acidity for, with only two exceptions, the reactions of the specimens were less acid than p_H 4.0 and even at this hydrogen ion concentration, amylase and trypsin are not destroyed. This relationship can possibly be explained as being due to the optimum reactions for enzymatic activity, for the optima for duodenal amylase and trypsin are both on the alkaline side of p_H 6.0, and the activity of both enzymes was usually greater in duodenal contents which were more alkaline than p_H 6.0. It is also likely that both the reaction and the enzyme content are indexes of the secretory power of the duodenum and pancreas and that if there were a plentiful secretion of enzymes, the amount of alkali secreted would also be large. A rough parallelism also existed between the amounts of amylase and trypsin secreted. However, none of these relationships were sufficiently constant so that in an individual case, if the amount of amylase were high, one could predict that the amount of trypsin would also be large or that the reaction would be alkaline. In the

patients who died as a result of diarrhea or dysentery, the acidity of the duodenal contents, as previously stated, was high and the amount of enzymes was low.

TABLE 7.—*Relation of the Hydrogen Ion Concentration to the Types of Organisms Found in the Duodenal Contents of Infants Regardless of the State of Their Digestion*

Hydrogen ion Concentration of the Duodenal Contents	No. of Specimens	Percentage of Specimens in Each Group Containing the Following Organisms (Aerobic Cultures)								
		Sterile	Colon Group	Strepto-cocci	Staphylo-cocci	Aciduric Bacilli	Spore Bearing Bacilli	Gram-Negative Cocci	B. proteus	Yeasts
p_H 3.3-4.8	9	22	33	56	22	11	11	0	0	0
p_H 5.0-5.8	11	18	45	36	27	18	0	9	9	18
p_H 6.1-6.5	13	23	31	31	46	0	0	8	0	8
p_H 7.0-7.7	11	18	45	27	36	9	0	18	0	36

As may be seen in Table 7, the hydrogen ion concentration had no obvious effect on the duodenal flora. An equal number of the alkaline and acid specimens were sterile. The acidity of the duodenal contents, therefore, is apparently not an important factor in sterilizing the duodenal conents.

TABLE 8.—*Relation of the Hydrogen Ion Concentration of the Gastric Contents and the Diet to the Results of Duodenal Analyses in Normal Infants and Those Convalescent from Diarrhea*

Hydrogen ion Concentration of Gastric Contents (Mean Value)	No. of Specimens	Percentage of Specimens in Each Group Obtained from Infants Receiving Some Form of Lactic Acid Milk*	Hydrogen ion Concentration of Duodenal Contents (Mean Value)	Units of Amylase per O.c. of Duodenal Contents (Mean Value)	Units of Trypsin per O.c. of Duodenal Contents (Mean Value)	Percentage of Duodenal Specimens in Each Group Containing the Following Organisms (Aerobic Cultures)							
						Sterile	Colon Group	Streptococci	Staphylococci	Aciduric Bacilli	Gram-negative Cocci	B. proteus	Yeasts
p_H 4.1	8	87	p_H 5.8	18.9	52.2	0	62	87	62	25	12	0	37
p_H 5.6	8	62	p_H 6.5	20.7	68.4	25	37	25	62	25	25	12	25

* Includes whole lactic acid milk (p_H 4.0), buttermilk (p_H 4.7) and protein milk (p_H 5.0).

HYDROGEN ION CONCENTRATION OF THE GASTRIC CONTENTS

As may be seen in Table 8, the more acid the gastric contents, the higher was the acidity of the duodenal contents. The specimens of gastric contents, the analyses of which are described elsewhere,[17] were obtained within a half-hour before and after the collection of the duodenal specimens. Four of the eight specimens in the first group (in which the mean value of the hydrogen ion concentration of the

17. Davison, W. C.: Some of the Factors which Affect Gastric Analyses in Infants, Am. J. Dis. Child. (in press).

gastric contents was p_H 4.1), and six of the other eight specimens were obtained from normal infants. The fact that there were more specimens from normal infants in the second group probably accounts for the greater amount of duodenal trypsin, the higher percentage of sterile duodenal cultures and the smaller percentage of those containing *B. coli* in the latter group. However, it is interesting that, in spite of the greater acidity of the gastric and duodenal contents and of the higher percentage of infants fed with some form of lactic acid milk in the first group, none of the specimens were sterile and *B. coli* and streptococci were found nearly twice as frequently. It would seem, therefore, that the acidity of the diet is not an important antiseptic factor. The hydrogen ion concentration of the gastric contents had no obvious effect on the amount of duodenal amylase and trypsin.

Fever.—Slight elevations of temperature (100 F.) had no apparent influence on the results of the duodenal analyses of normal infants and of those convalescent from diarrhea. However, all of the patients who died as a result of diarrhea or dysentery were definitely febrile, so that it is possible that fever might have been an important underlying factor in the reduction of enzymatic activity and the consequent or coincident bad state of digestion. It is conceivable that in patients in whom diarrhea develops after an acute febrile illness, the dehydration resulting from the high fever may decrease the amount of pancreatic secretion in much the same way as the urinary excretion is reduced. On the other hand, it is also likely that the fever of the patients who died as a result of diarrhea was due, in part at least, to the dehydration produced by the loss of water in the frequent stools. It is probable that dehydration, whether caused by excessive summer heat or by fever, is an important factor in the reduction of duodenal enzymes. The diminution of gastric acidity, which Marriott and Davidson [18] and Ylppö [19] have reported in febrile infants, may have been due to the same cause, namely, dehydration, although another explanation is possible.[17] It is interesting that Ylppö [19] described an increase in the number of stools passed by these febrile infants. More data are being collected in regard to the effect of increased body temperature on gastric and duodenal secretions.

Vomiting.—Observations similar to those given in the foregoing in regard to fever may also be made for vomiting. Occasional vomiting had no apparent effect in the normal and convalescent groups, while all of the infants who died as a result of diarrhea or dysentery suffered from nausea and vomiting.

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18. Marriott, W. McK., and Davidson, L. T.: The Acidity of the Gastric Contents of Infants, Am. J. Dis. Child. **26**:542-553 (Dec.) 1923

19. Ylppö, A.: Ueber den Einfluss Mechanischen und infektiosen Fiebers auf die Acidität des Mageninhalts bei Säuglingen, Acta Pediat. **3**:213-231, 1924.

SUMMARY

The data presented in this paper suggest that in digestive disturbances in infants, especially in diarrhea and to a lesser extent in bacillary dysentery, the activity of the duodenal amylase and trypsin is decreased, and the hydrogen ion concentration of the duodenal contents and the numbers of colon bacilli in the duodenum are increased. While, of course, no definite conclusions can be drawn until more observations are collected, at present it would seem plausible to suppose that five factors may be responsible for the production of diarrhea in infants: (1) a primary cause which is at present undetermined but which may be different in individual cases, namely, external heat, fever, infections and overfeeding with an improper diet; (2) a reduction in the activity of the duodenal enzymes and secretions as a result of the primary insult; (3) an accumulation of undigested and unabsorbed food material in the duodenum as a consequence of the reduction in enzymatic activity; (4) the invasion of this food material by organisms of the colon group from the cecum and large intestine, and (5) the fermentation of this food material by these organisms and the formation of irritating end-products which accelerate peristalsis and produce diarrhea.

ACID EFFECT OF HYDROCHLORIC ACID AND LACTIC ACID MILK*

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During the last year I have had considerable experience with acidified milk, using either tenth normal hydrochloric or 75 per cent. lactic acid. Several interesting facts regarding hydrochloric acid milk, which were not present when lactic formulas were used, have been noticed. Among others, it was observed: first, that the mothers almost invariably stated that the child was urinating more frequently; second, that the urine was persistently acid, often to such an extent that the buttocks were excoriated.

With the idea in mind of obtaining more accurate knowledge of the exact metabolism of these two acids, the measurement of twenty-four hour urine output and the acid effect produced by each was undertaken.

Henderson and Palmer [1] showed that the acid effect of any acid can be estimated by measuring the increase of titrable acidity and ammonia in the urine after the administration of the acid. The sum of these two factors make up the total acidity of the urine, which they demonstrated to be a measure of the acid effect produced by the ingested acid.

Hydrochloric and lactic acid are true representatives of mineral and organic acids, so what is true for them probably holds for other acids of their respective groups.

The experiment was conducted along the following lines: All the babies were started on hydrochloric acid milk as advocated by Faber,[2] the formula being as follows: whole milk, 960 c.c.; tenth normal hydrochloric acid, 240 c.c.; karo corn syrup, red label, 60 c.c. No other fluids or food were administered during the experiment. The child was left on this formula until he was taking the required amount and there was no vomiting. Three days were then allowed before the experiment was started, to ensure a constant intake. If vomiting occurred at any time during the period of the experiment, or if the child would not finish his bottle, the experiment was stopped and a new start made.

At the end of this time, all the urine was collected and the twenty-four hour output noted. A titrable amount of normal hydrochloric acid was placed in each bottle to prevent bacterial action. The titrable acidity and ammonia of the twenty-four hour specimen were determined, and

* Received for publication, Feb. 20, 1925.

1. Henderson and Palmer: J. Biol. Chem. **17**:305, 1914.
2. Faber, H. K.: Am. J. Dis. Child. **26**:401 (Nov.) 1923.

the amounts expressed in cubic centimeters of tenth normal solution. The total acidity also was computed and all the results were recorded as shown.

The child was then placed on a lactic acid formula of the same dilution: milk, 960 c.c.; water, 232 c.c.; 75 per cent. lactic acid, 8 c.c.; karo, 60 c.c. The same procedure was carried out as with the hydrochloric acid milk.

In order to have an accurate control, the urine was collected over a period of four days and all determinations were made from the entire four days' specimen. The results were divided by four to give the controls for twenty-four hours. This step was necessary to insure accuracy in the controls, as there were slight fluctuations in the twenty-four hour outputs. The formulas in the controls were made up to the same fluid and sugar contents as were used in the acid milk, but the dilutions were milk, three-fifths; water, two-fifths. This was necessary, as it appeared undesirable to give these infants four-fifths milk without the addition of some acid.

The ammonia determinations were made by the formol titration method, which was found accurate within 5 per cent., when compared with Kjeldahl's method.

The results are summarized in the following table:

The Results of Urine Determinations in Twenty-Four Hours

Name	Acid	Urine Output, 24 Hours	Total NH_4 C.c. Tenth Normal Solution	Total Titrable Acidity, C.c. Tenth Normal Solution	Total Acidity in C.c. Tenth Normal Solution
H. ..... Weight, 11 lb. 8 oz. Intake: total fluid, 1,200 c.c.; tenth normal hydrochloric acid, 240 c.c.; 75% lactic, 8 c.c.	Normal.....	315	121	63	184
	Hydrochloric	365	187.2	105	292
		410	348.5	114	463
	Lactic.....	290	101.5	22	123
		310	83.3	83.7	167
M. ..... Weight, 13 pounds. Intake: total fluid, 1,200 c.c.; tenth normal hydrochloric acid, 240 c.c.; 75% lactic, 8 c.c.	Normal.....	408	62.2	84	146.2
	Hydrochloric	475	159.8	122.2	302
		460	200.5	92	292.5
		450	238.5	121	360.5
		455	306	134	440
	Lactic.....	405	190	64	254
		412	164	37	201
		395	105.6	51	156.6
S. ..... Weight, 7 lb. 8 oz. Intake: total fluid, 720 c.c. tenth normal hydrochloric acid, 120 c.c.; 75% lactic, 4 c.c.	Normal.....	128	22	14	171
	Hydrochloric	155	104	52.1	156.1
		175	153	54.2	207.2
	Lactic.....	125	63.8	32.5	96.3
		140	33.1	29.5	62.6

As will be noted from the table, the amount of urine excreted when the infant was on hydrochloric acid milk was from 20 to 30 per cent.

greater than the control. When the formula was changed from hydrochloric to lactic acid milk, the output approached that of the control period, and even fell slightly below.

It is evident, from the foregoing figures, that hydrochloric acid milk exerts a diuretic action, which is not shared by lactic acid formulas.

TOTAL ACIDITY

The two factors controlling the constant level of the fixed bases in the blood plasma, are: first, the ability of the blood to excrete an acid urine from an alkaline blood; second, the production of ammonia salts from the urea, which carry acids to excretion. Both these factors are readily extensible in the presence of increased acid metabolism.

The titrable acidity and excreted ammonia make up the total acidity of the urine, and are indexes of the acid effect produced by the ingested acid.

From the table it is seen that hydrochloric acid milk produces a marked increase of total acidity of the urine, while the total acidity following the administration of lactic acid formula often falls below that of the control.

Theoretically, 1 c.c. of 75 per cent. lactic acid is equivalent to 84 c.c. of tenth normal hydrochloric acid. In short, Babies H. and M., who were receiving 8 c.c. of 75 per cent. lactic acid, were getting the equivalent of 672 c.c. of tenth normal hydrochloric acid, as compared with the 240 c.c. of actual acid in the hydrochloric milk feedings.

The result was that the p_H of the lactic acid milk was higher than that of the 25 per cent. hydrochloric formula.

In spite of these facts, the acid effect of the hydrochloric acid milk was much greater than that of lactic acid formula. The reason for this is evident; namely, the hydrochloric acid is being carried for excretion, which demand is met by the increase of titrable acidity and ammonia in the urine, while the organic acid has probably been oxidized to carbon dioxid and water before reaching the kidneys.

In short, lactic acid, which has as much or more effect on the buffer substances of the milk as hydrochloric acid, is readily oxidized by the body, and has little effect on the acid-base mechanism of the individual.

TITRABLE ACIDITY AND TOTAL AMMONIA

Regarding these two factors there is little to say, except that together they make up the total acidity.

COMMENT

This paper is offered not with any idea of discrediting hydrochloric acid milk, which has a large field of usefulness among healthy babies,

especially because of its prophylactic action against rickets, but to show that the administration of lactic acid milk does not upset the acid base balance.

CONCLUSIONS

1. Hydrochloric acid milk exerts a marked diuretic action not shared by lactic acid formulas.

2. The total acidity of the urine, which is the measure of the acid effect produced by any ingested acid, is markedly increased by hydrochloric acid, but is little changed by lactic acid milk.

3. The reason that lactic acid has little effect on the total acidity of the urine is probably because it is completely oxidized in the blood stream, and, therefore, has little effect on the acid base balance of the blood plasma.

ANHYDREMIC ACIDOSIS DUE TO LACTIC ACID*

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The term "acidosis" designates the lowering of the alkali reserve of the body caused by abnormal production or retention of acids. The types of acidosis most clearly distinguished are: (1) the acetone-body type, due to aceto-acetic and betahydroxybutyric acids; and (2) the phosphoric acid type, due to to the retention of acid phosphate. In this paper, evidence for the existence of a type of acidosis due to lactic acid will be presented.

ETIOLOGY

The most generally accepted view at present regarding the origin and fate of lactic acid in the tissues appears to be the following: whenever the tissues perform mechanical work, d-lactic acid is suddenly formed from a precursor, lactacidogen (apparently a derivative of hexosediphosphoric acid) and the alkali reserve in the active tissues falls. During the ensuing period of rest, the lactic acid normally is removed in several ways: (1) by oxidation, (2) by synthesis to glycogen or to lactacidogen requiring also oxidation, (3) by removal as sodium lactate through the circulation to other tissues, such as the liver or the muscles, where it may undergo the chemical changes mentioned. Very small quantities are normally eliminated in the urine. Under normal conditions of activity, circulation and oxygenation, the removal of lactic acid is so rapid that the alkali reserve of the body as a whole remains practically unaffected. Whenever the circulation or the processes of oxidation become insufficient, the rate of removal of lactic acid will be less than the rate of its production, so that the lactic acid concentration in the blood will rise, and the alkali reserve of the tissues (including the blood plasma) will fall. Whenever the rate of production of lactic acid exceeds the rate of its removal by even the normal mechanism, lactic acid acidosis may result. This occurs in athletes, especially when untrained. Lactic acid acidosis of severe degree is often observed in normal rabbits after exertion.

In cases of cardiac decompensation, oxygenation in the tissues is interfered with and lactic acid accumulates. With improvement in the circulation the lactic acid promptly disappears from the blood; for example, in one of our cardiac patients with marked dyspnea, the blood lactic acid rose to 161 mg. per hundred cubic centimeters, and the blood

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* From the Department of Pediatrics, Washington University School of Medicine, and the St. Louis Children's Hospital.

bicarbonate fell to 22 per cent. by volume. The patient was bled and the next day the circulation was greatly improved. There was no more dyspnea, the blood carbon dioxid had risen to 54 per cent. by volume, and the lactic acid of the blood had fallen to 37 mg.

ALIMENTARY INTOXICATION

The purpose of this paper is to call attention to the existence of lactic acid acidosis in the so-called alimentary intoxication of infancy. The essential feature of "alimentary intoxication" is anhydremia. As the acidosis present in cases of anhydremia has been only in part accounted for by the retention of acid phosphate (Marriott[1]), the failure of the kidney to form ammonia, or the loss of alkali in the stools and urine, and rarely is accompanied by ketosis, a preliminary investigation was made of the nature of the acids present in the blood and urine of such cases.

As the amount of material was so small that ordinary chemical methods for identification could not be applied, use was made of the "distribution coefficient." When an acid is added to a mixture of two immiscible solvents, such as ether and water, and shaken for a time, the acid will distribute itself between the two liquids in such a manner that the concentration in ether depends only on the concentration in water and the temperature and not on the absolute quantities of acid, ether or water. The ratio of the concentrations is nearly constant. Since it is not affected by the presence of small amounts of other substances as are some other physical constants, the distribution coefficient (or ratio) may be used to obtain some idea of the character of an unknown acid.

EXPERIMENT

The blood was deproteinized by means of tungstic acid; the filtrate, evaporated in vacuo, was acidified with sulphuric acid and extracted with ether. The extracts were carefully titrated with barium hydroxid, filtered, evaporated and reextracted with ether. This second extraction was performed in steps; small successive portions of sulphuric acid were added, each portion being sufficient to liberate one fifth of the calculated quantity of acid as determined by the barium hydroxid titration. It is obvious that those acids which are "weaker," namely, having smaller dissociation constants, will be liberated first. Since these are in general also more soluble in ether, the successive fractions will represent a fairly good separation.

It was found that in normal blood, two acids at least occur: one, in small quantities, with a distribution coefficient similar to that of beta-

1. Marriott, W. McKim: Some Phases of the Pathology of Nutrition in Infancy, Am. J. Dis. Child. **20**:461 (Dec.) 1920.

hydroxybutyric acid; the other, in larger quantities, resembling lactic acid. In urine, these two acids are also present, but that resembling lactic acid occurs in a relatively smaller quantity. Approximate tests showed that in cases of anhydremia and of cardiac failure, the blood lactic acid is often greatly increased. In the urine of anhydremia patients, large amounts of an ether insoluble organic acid are also found —possibly "oxyproteic."[2] It must not be supposed, therefore, that the lowering of the alkali reserve in anhydremia is due entirely to lactic acid; rough calculations based on the equivalent of 1 per cent. by volume of carbon dioxid to 4 mg. per cent. of lactic acid make this improbable. We have observed two cases of anhydremic acidosis, in which the very low alkali reserve was accompanied by neither acetone bodies nor high blood lactic acid.

Examinations of the blood were made on venous blood which was removed with little stasis, oxalated and kept under oil. Lactic acid was determined on whole blood,[3] and the alkali reserve on the plasma.

TABLE 1.—*Blood Lactic Acid in Normal Children*

No. of Cases	Mg. per 100 C.c.
10	5-10
11	10-15
27	15-20
12	20-25
10	25-30
6	30-35
2	35-40
78 Total	Average 19.5

CONTROL

Normal controls were convalescent children with no evidence of acidosis. It was found essential that the patient should lie quietly in bed for some time before and during venapuncture. The muscular work incident to kneeling or standing is sometimes sufficient to raise the lactic acid content of the blood. Normal figures, expressed as milligrams of lactic acid per hundred cubic centimeters of blood are found in Table 1, which shows the frequency distribution of values in seventy-eight individuals.

CHARACTERISTICS

Anhydremic acidosis is, under certain conditions, associated with a considerable elevation of lactic acid (Table 2). The clinical characteristic of this group is the acute loss of fluid, caused by diarrhea and vomiting, in a previously well-nourished person. Dysentery and ketosis

2. Utheim, Kirsten: Metabolism Studies in Infants Suffering from Chronic Nutritional Disturbances (Athrepsia), Am. J. Dis. Child. **22**:329 (Oct.) 1921.

3. Clausen, S. W.: J. Biol. Chem. **52**:263 (May) 1922.

are, as a rule, not present. Contrasting with this group is a series of cases of acidosis of the ketosis type presented in Table 3. Although anhydremia was present in each case, in none was the blood lactic acid high. Starvation, with depletion of the carbohydrate reserve, especially of the lactacidogen, may explain this finding. In rabbits, after prolonged fasting, exercise fails to cause elevation of blood lactic acid to

TABLE 2.—*Acidosis Due to Lactic Acid Cases with Little or No Ketosis*

Name	Date	Age	Blood Lactic Acid	Plasma Carbon Dioxid	Remarks
E.	10/ 8/19	4 mo.	142	20	Marked anhydremia
N.	11/15/19	6 mo.	23	45	Moderate anhydremia; dysentery, fair nutrition
	11/30/19	6 mo.	44	35	Increased anhydremia, slight ketosis
D.	1/13/20	17 mo.	61	14	Well nourished, suddenly developed anhydremia, hyperpnea
	1/14/20	.....	25	76	Recovered after intraperitoneal saline; no alkali was given
S.	9/11/20	4 mo.	116	22	Very sudden onset, diarrhea and vomiting; anhydremia
	9/12/20	.....	...	37	Fluids and alkali
	9/13/20	.....	30	77	Symptoms of tetany, edema, alkaline urine
G.	9/17/20	3 mo.	73	25	Sudden onset, diarrhea, vomiting
S.	9/24/20	5 mo.	56	39	Moderate hyperpnea; received fluids and alkali
	9/25/20	.....	34	85	Alkalosis, died in convulsions
S.	11/ 3/20	10 mo.	54	27	Diarrhea and vomiting
H.	11/24/20	13 mo.	150	20	Marked anhydremia
	11/26/20	.....	90	37	Improved with Ringer's solution only
K.	12/31/20	2 yr.	53	33	Postoperative slight ketosis
G.	12/10/22	1 yr.	57	42	Suddenly developed anhydremia; slight ketosis
E. T.	10/17/22	1 yr.	70	20	Suddenly developed anhydremia; no ketosis
H.	11/26/22	4 mo.	45	51	Premature infant; slightly cyanotic
	11/27/22	.....	50	34	Anhydremia
J. M.	2/24/23	2 yr.	63	28	Lye stricture of esophagus; marked starvation; dry slight ketosis
C. W.	10/ 4/23	1 yr.	48	38	Dysentery; no ketosis
T. W.	3/ 3/23	1 yr.	34	51	Miliary tuberculosis
	3/ 4/23	.....	53	39	Vomiting, anhydremia

TABLE 3.—*Cases of Ketosis with Little or No Rise in Lactic Acid*

Name	Date	Age	Blood Lactic Acid	Plasma Carbon Dioxid	Remarks
V. H.	9/16/20	6 mo.	35	39	Moderate hydremia; recovered
	10/ 4/20	.....	35	22	Marked ketosis; dysentery
B.	6/14/21	6 mo.	30	29	Starvation; badly nourished
C. G.	7/24/22	4 yr.	12	31	Had received daily castor oil; very bad nutrition
B. P.	10/30/22	3 mo.	33	23	Extreme malnutrition
M. R.	6/ 7/21	10 mo.	33	31	Extreme malnutrition
S.	11/20/22	5 mo.	24	31	Extreme malnutrition
C. C.	4/13/23	17 mo.	34	31	Lye burn of esophagus of 4 weeks' duration

such a degree as before the fast. In diabetic coma, low values of blood lactic acid are found. One may assume that lactic acid acidosis does not exist if the urine gives a strong ferric chlorid reaction for acetoacetic acid.

The essential feature in the production of anhydremic lactic acid acidosis is a sudden decrease in blood volume and volume flow in an organism provided with sufficient lactacidogen. It is obvious, therefore, that restoration of the circulation should suffice promptly to relieve the acidosis.

When in anhydremia the circulation is improved by intravenous injections of glucose, glucose-acacia or blood, or by intraperitoneal administration of fluid, symptoms of acidosis rapidly disappear. Since the lactic acid is present as sodium lactate, it is obvious that the alkali reserve must also rise.

Attention is directed to those patients who received sodium bicarbonate. As might be expected, with the improvement in their circulation, these patients became overloaded with alkali. The first example of this effect occurred in a well-nourished infant, aged 4 months, who had had diarrhea and vomiting of three days' duration. On admission, the picture was that of alimentary intoxication with an alkali reserve of 20 per cent. by volume. Treatment was 100 c.c. of Ringer's solution intraperitoneally, 100 c.c. of 4 per cent. sodium bicarbonate, intravenously, and 1.3 gm. of sodium bicarbonate every three hours by mouth. In twenty-four hours 13 gm. of sodium bicarbonate had been retained. The alkali reserve was now 37 per cent. by volume, although the sodium was discontinued the alkali reserve rose to 77 in the next few hours. As the alkali reserve rose, the blood lactic acid fell from 116 to 30 mg. per hundred cubic centimeters. The patient developed edema and the symptoms of tetany, including convulsions; the latter condition was controlled by subcutaneous injections of magnesium sulphate. For nearly ten days the patient's urine was strongly alkaline.

Another example of overalkalinization was D.C.S., a well nourished infant, aged 5 months, with a suddenly developing anhydremia. There was only a moderate acidosis; alkali reserve 39; lactic acid 56. Unfortunately, he received 50 c.c. of 4 per cent. sodium bicarbonate intravenously, and 1.3 gm. of sodium bicarbonate by mouth every two hours. The urine rapidly became alkaline, the alkali reserve rose to 85, the blood lactic acid fell to 34. The patient developed severe tetany and died.

COMMENT

In view of such clinical results, it is obviously unwise to administer alkali to patients with lactic acid acidosis unless the alkali reserve approaches 20.

Acidosis, due to acetone bodies, apparently recovers much more slowly when the circulation is restored, because it depends on such other factors as liver injury associated with dysentery, or long continued starvation resulting in an actual depletion of the body buffers. Alkali therapy, accordingly, is not so liable to result in disaster. But here, too, rational treatment should be directed toward improving the underlying condition. In ketosis, we have seen very rapid improvement follow the intravenous injection of glucose and insulin.

CONCLUSIONS

1. Evidence is presented for the existence of a type of acidosis due to lactic acid.

2. This type of acidosis occurs clinically in cases of circulatory failure, especially in cardiac decompensation and anhydremia.

3. Anhydremic acidosis is not caused by lactic acid in all cases.

4. Ketosis is not marked in lactic acid acidosis.

5. Lactic acid acidosis is adequately relieved by the treatment of the underlying circulatory condition.

6. Administration of alkali in lactic acid acidosis is liable to cause alkalosis.

AURICULAR FIBRILLATION

REPORT OF CASE IN A CHILD AGED TEN YEARS *

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Auricular fibrillation in childhood, although not unknown, is of rare occurrence. Only three cases of patients 10 years of age or less have been reported in the literature; two were rheumatic in origin and one followed diphtheria.

In a series of 116 cases reported by Thomas Lewis, there were only four patients under 20 years of age, according to Abt.[1]

The youngest patient reported is that of a child, aged 5 years, cited by Sutherland and Coombs.[2] Auricular fibrillation was discovered on the fifth day of acute rheumatic heart disease; death occurred on the sixth. Necropsy showed an existing pancarditis.

Ehrenreich [3] reported a case occurring in a child, aged 9 years, with an indefinite history of acute articular rheumatism three years previously. One year later, signs of cardiac involvement appeared, with several subsequent attacks of myocardial insufficiency before auricular fibrillation occurred. At this time Ehrenreich knew of no reported case occurring in a child under 13 years of age with a rheumatic background. He, however, mentions a case published by Price and MacKenzie,[4] in which auricular fibrillation developed in a girl, aged 9 years, following an attack of diphtheria. This case showed an auriculoventricular block with fibrillation of the auricles, the ventricular rate remaining slow and regular.

In view of the evident rarity of auricular fibrillation in children, it seemed of interest to report a case occurring in a child on the Children's Service of the Massachusetts General Hospital. On looking over the records of the hospital, this boy was found to be the youngest patient with recognized auricular fibrillation who had ever been admitted.

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* Received for publication, April 15, 1925.

* From the Children's Medical Department, Massachusetts General Hospital.

1. Abt's Pediatrics: Auricular Fibrillation, **4**:389, 1924.

2. Sutherland, G. A., and Coombs, Carey F.: A Case of Acute Rheumatic Carditis and Auricular Fibrillation in a Child, Heart **5**:15, 1913-1914.

3. Ehrenreich, S. G.: A Case of Auricular Fibrillation in a Child, New York M. J. **99**:269, 1914.

4. Price and MacKenzie: A Case of Auricular Fibrillation in a Child following Diphtheria, Heart **3**:233, 1911-1912.

REPORT OF CASE

History.—J. S., a boy, aged 10 years, American, of Polish descent, first entered the hospital April 9, 1924, complaining of a sore throat. His temperature was 102.4 F., pulse 104, and respiration 30.

The past history revealed that the patient had had diphtheria, chickenpox, and influenza. Four years previously he had been in bed for four weeks with rheumatic fever. Subsequently, on two different occasions, he has had hospital care for cardiac rest. There had been repeated attacks of upper respiratory infection, sore throat and joint pains. The outpatient records report the apex rate to have been as low as 60, not affected by exercise.

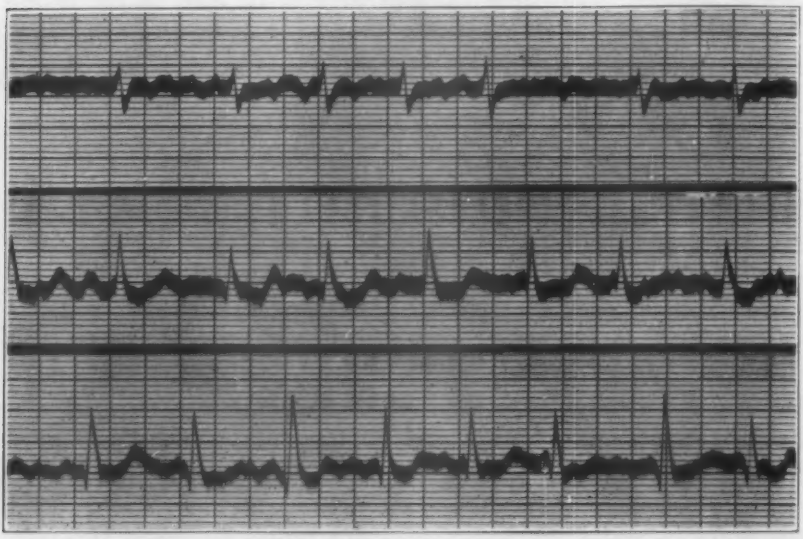

Fig. 1.—Auricular fibrillation, rate 100. Diphasic T Wave, Lead II.

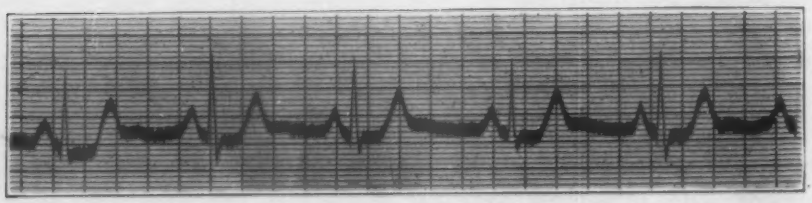

Fig. 2.—Normal rhythm, rate 60.

The family history was not important.

Physical examination showed a rather tired, pale and sick looking boy. The tonsils were large, ragged and inflamed. The pharynx was injected. There were tender palpable cervical glands on the right side, and a few carious teeth. The heart was regular in rhythm at this time. The apex impulse was forceful in the fifth interspace 7 plus cm. to the left of the midsternal line and 1 cm. beyond the midclavicular line. The cardiac dulness was increased to the right. At the apex a systolic murmur and a mid-diastolic rumble were heard. Along the left of the sternum a short early diastolic blow was heard. The Wassermann test was negative.

A diagnosis of rheumatic heart disease, mitral stenosis and regurgitation, aortic regurgitation, chronic tonsillitis and questionable acute endocarditis was made.

The patient was in the hospital for about seventeen days, during which time tonsillectomy was performed and the carious teeth were removed. Shortly after leaving the hospital, the patient developed acute otitis media and a gastro-intestinal upset with anorexia, nausea and vomiting. Three weeks after discharge, he returned to the hospital.

At this time a rapid irregular pulse and a pulse deficit of 40 were discovered. There were moist râles throughout both lungs. The heart findings were as before, with the exception of a diastolic thrill now found at the apex. An electrocardiogram showed coarse auricular fibrillation, ventricular rate 100 and a diphasic T_3 wave. Digitalis had been started the day previous.

The patient was digitalized in three days with 13½ grains of digitalis. It is interesting to note here that whereas the amount of digitalis, figured on the basis of 0.1 gm. per 10 pounds body weight, was sufficient to digitalize him, it required between 0.2 gm. and 0.3 gm. a day to keep him digitalized.

It was thought suitable at this time to administer quinidin, which was started on the eleventh day, digitalis being continued. The amount of quinidin was increased from day to day, but it was not until a dose of 44 grains was given that the rhythm became normal. The patient had received a total of 270½ grains of quinidin in fourteen days. There were no symptoms of cinchonism.

The patient was seen in the Outpatient Department during the following seven months after discharge. He was always a little dyspneic and complained of frequent colds, of a cough and of occasional pains in his joints. The rhythm, however, remained normal and was so ten days before the most recent entry, Feb. 7, 1925.

At this time chronic otitis media developed. The heart rhythm was irregular, the rate 200 and a pulse deficit of 20. The boy was easily digitalized in three days, but in this instance a daily dose of 1½ grains of the digitalis leaf was sufficient to keep him digitalized.

Quinidin was not given in view of the fact that there was so much heart damage, because too much of the drug had been needed on the previous stay in the hospital to restore normal rhythm and because of the likelihood of frequent relapses.

A teleroentgenogram of the heart showed it to be enlarged in all dimensions. The electrocardiogram was the same as on previous entry.

The patient was discharged to outpatient care on daily doses of 1 grain of digitalis.

Hartford General Hospital.

THE BASAL METABOLISM OF CHILDREN WITH ICHTHYOSIS *

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Ichthyosis is characterized by dryness and scaliness of the skin, and in severe cases it bears a resemblance to the skin of fishes. Ichthyosis was recognized in the Middle Ages and was first accurately described by Willan in his work on cutaneous diseases (1796-1808). From time to time in the last four decades, reports of cases have appeared in which the symptoms have been ameliorated by the administration of thyroid extract, and others in which pathologic changes have been found in the thyroid gland.[1]

Clinical evidence has seemed to indicate a relationship existing between this disease and hypothyroidism. Consequently, the basal metabolism was determined on the following series of patients on whom the diagnosis of ichthyosis had been made by the Skin Department of the Massachusetts General Hospital.

REPORT OF CASES

CASE 1.—H. K., a girl, aged 9 years, whose family and past history were unimportant, had suffered from ichthyosis from an early age. The physical examination was normal except for the characteristic skin condition.

CASE 2.—C. V., a boy, aged 10 years, was overweight, and had puffy eyes and mild ichthyosis. He had received from 1 to 1.5 gm. of thyroid extract daily at irregular intervals with definite temporary improvement. Aside from obesity and puffiness of the eyes, there were no signs or history suggestive of myxedema. The thyroid extract was omitted and metabolism studies were made.

CASE 3.—W. J., a boy, aged 6 years, whose family history was negative, except that his father and mother were cousins, and his paternal grandfather had a dry skin. The child was thin for his height and showed the characteristic skin of ichthyosis.

CASE 4.—M. C., a girl, aged 11 years, complained of being tired all the time. The hair was coarse and dry and the skin was rough and dry since birth. The history and examination otherwise were negative.

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* From the Children's Medical Department, Massachusetts General Hospital and the Department of Pediatrics, Harvard Medical School.

* This paper is No. 43 of a series of studies in metabolism from the Harvard Medical School and allied hospitals. The expenses of this investigation have been defrayed, in part, by a grant from the Proctor Fund of the Harvard Medical School for the study of chronic diseases.

1. Hess, J. H., and Schultz, O. T.: Keratosis Diffusa Fetalis, Am. J. Dis. Child. **21**:357 (April) 1921.

CASE 5.—W. McG., a boy, aged 2 years and 10 months, whose family history was negative except that an older sister had the same complaint. For the last ten months the skin has resembled "fish skin" especially on the extremities. This improved somewhat with the application of an ointment. After determining the metabolism, the boy was given ½ grain (0.03 gm.) of thyroid extract daily with subsequent temporary improvement. The condition later became worse following measles, but improved after exposure to the quartz lamp.

CASE 6.—H. R., a boy, aged 11 years, had an unimportant family history. Ichthyosis was first noticed at the age of 7 years and became increasingly worse; at the time of examination the whole body except the face and part of the back was covered with thick dry scales. The hair was abundant but was moderately dry and coarse. The boy was given thyroid extract for four or five months at the onset with some improvement, after which it had no effect and was omitted. The patient had never perspired. The basal metabolism was determined and 3/10 grain (0.019 gm.) of thyroid extract was given daily with considerable improvement but not with complete cure.

CASE 7.—E. G., a girl, aged 12⅓ years, whose skin had been dry for about the last eight years. After the metabolism was determined, thyroid extract in ¼ grain (0.04 gm.) doses was given for a short time, and she was reported as temporarily improved.

CASE 8.—T. W., a boy, aged 3 years, had had dry skin since birth. The lower part of the legs, the upper part of the arms and the back had hexagonal scales resembling "fish skin."

After an appreciable lapse of time, the basal metabolism was determined in those patients who had received thyroid therapy.

COMMENT

The clinical record of these cases suggests a slight temporary improvement of symptoms after the administration of varying doses of thyroid extract. It was not the pronounced improvement seen in true cases of hypothyroidism. The impression obtained from this group of patients was that, in the majority of them, the benefit derived from this form of therapy was not sufficiently marked to warrant a continuance of the treatment with any great amount of enthusiasm. According to Howland:[2]

> One thought is to be remembered, that whether the deficiency is of a gland, in whole or in part, or of some article in the diet, substitution therapy is or should be strikingly successful almost immediately.

The metabolism of this series of cases is given in the table.

These findings show a variation from normal to plus 35 per cent. Krogh and With,[3] in their study of the metabolism of six patients with ichthyosis, found the metabolism normal in five instances; in the sixth patient, a woman, aged 29, the metabolism was minus 20 per cent.

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2. Howland, John: A Consideration of Endocrine Therapy in Infancy and Childhood, South. M. J. **17**:743 (Oct.) 1924.

3. Krogh, M., and With, C.: Ugesk. f. Læger **85**:353 (May 17) 1923.

Linser and Schmid [4] found the basal metabolism normal in a case of ichthyosis hystrix, in which there was a marked absence of the sweat glands.

The evidence from basal metabolism studies, therefore, is strongly against any definite relationship between deficiency of the thyroid gland and the ichthyosis. A search of the literature does not reveal any convincing pathologic data of the dysfunctioning of the thyroid gland in this disease. Reports of microscopic postmortem changes cannot be taken as proof of functional incapacity during life.

The Basal Metabolism of Patients in This Series

Case	Age, Years	Sex*	Height, Cm.	Weight, Kg.	Total Calories	Calories per Sq. M. (Benedict and Talbot)	Deviation from Normal, Sq. M. Body Surface per Cent.
1. H. McK.	9¾	♀	...	29.93	1,004 1,082 1,041	1,007 ‡ 1,085 1,044	+ 7
2. C. V.	12 12⅔	♀ ..	144 ...	37.3† 45.8	1,323 1,241	987.2 969.5	± 0
3. W. J.	6	♂	115	19.0	1,140	1,430	+35
4. M. C.	11¼	♀	...	30.39	1,231 1,207 1,255	1,139 1,209 1,161	+22
5. W. McG.	2⅝ 3⅝	♂ ..	... 90.7	11.79	679	1,237	± 0
6. H. R.	11	♂	119	19.07	990 975	1,230‡ 1,211	+20
7. E. G.	12½	♀	147	33.43	1,324 1,222	1,118‡ 1,032	+11
8. T. W.	3	♂	96.2	14.09	873 816	1,402‡ 1,367	+22

* In this column, ♀ indicates female; ♂, male.
† Approximately.
‡ Body surface measured by DuBois measurements and calculated from the linear formula. They are comparable with the Benedict and Talbot formula. Benedict and Talbot: Metabolism and Growth from Birth to Puberty, Carnegie Institution of Washington, Publication No. 302.

Clinical reports of improvement after the administration of thyroid extract are far from convincing, especially since most writers admit that it confers only temporary relief. Such improvement as is obtained is hard to explain. Further difficulties in estimating the clinical benefits of thyroid therapy arise from the fact that even without treatment ichthyosis varies in severity at different seasons of the year, being more severe in the winter and less intense in the summer.

CONCLUSION

Basal metabolism studies lead to the conclusion that ichthyosis in the majority of cases is not due or related to hypothyroidism. Whatever seeming temporary improvement may result from the administration of thyroid extract must be explained by some other means than the direct action of thyroxin on the metabolism.

4. Linser and Schmid: Deutsch. Arch. f. klin. Med. **79**:514, 1903.

LIPOLYTIC ACTIVITY OF THE BLOOD SERUM IN TUBERCULOSIS *

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NEW YORK

In diagnosing a case of tuberculosis, it is desirable to have additional aids to the clinical evidence. This is especially true in infants and children in whom it is difficult to obtain subjective symptoms. The present work is an attempt to study the relations between the serum lipolytic activity of patients having tuberculosis and their clinical condition. By lipolytic activity of the serum is meant the power of the serum to convert neutral fat into fatty acids and glycerol.

In 1900, Achard and Clerc [1] made studies of the lipolytic power of human blood serum. Later, Garnier [2] wrote about the fat splitting activity of the serum of adult patients suffering from tuberculosis. He concluded that chronic tuberculous infiltration of the lung is accompanied by a diminished serum lipase, and considered a persistently low serum lipolytic activity as an indication of a bad prognosis. Kollert and Frisch [3] studied the relation between the lipolytic power of the serum and the severity of the lesions in fifty-nine adult patients with tuberculosis, and found that the severer the case the lower the fat splitting power of the serum. In children, the lipolytic activity of the serum was studied by Lederer,[4] Hizume,[5] Beumer,[6] Asal and Falkenheim,[7] and Falkenheim and Gottlieb.[8] The latter three authors also investigated the serums of children having tuberculosis, and concluded that the lipase activity is a good index of the patient's condition.

The lipolytic activity of the serum is given conveniently in terms of the number of minutes required by 0.5 c.c. of the serum to change

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* Received for publication, April 2, 1925.

* From the New York Nursery and Child's Hospital, Department of Pediatrics, Cornell University Medical College.

1. Achard and Clerc: Arch. de méd. expér. et d'anat. path. **12**, 1900.

2. Garnier: Compt. rend. Soc. de biol. **55**:1423, 1903.

3. Kollert and Frisch: Die Sogenannten Blutlipase bei Tuberculose, Beitr. z. Klin. d. Tuberk. **44**:303, 1920; ibid. **47** and **48**, 1921.

4. Lederer, M.: Monatschr. f. Kinderh. **27**:608 (March) 1924.

5. Hizume: Jahrb. f. Kinderh. 227 (July) 1921.

6. Beumer, H.: Monatschr. f. Kinderh. **23**:265 (June) 1922.

7. Asal, B., and Falkenheim, C.: München. med. Wchnschr. **70**:291 (March) 1923.

8. Falkenheim, C., and Gottlieb: München. med. Wchnschr. **70**:291 (March) 1923.

the surface tension of 30 c.c. of a fully saturated to a half saturated tributyrin solution, the reaction taking place at the optimum p_H for blood lipase activity, which is 8.3.[9]

The lipolytic power of normal blood serum is fairly constant, requiring from twenty-five to thirty-five minutes for this change. The less time required the greater is the fat splitting power of the serum. Lederer, in a study of ninety-two normal infants and children, found in 70 per cent. of them a serum lipase value of from twenty-five to thirty minutes. In two instances the value was forty-nine minutes. The serum from two premature babies less than 24 days of age had very low lipolytic power, from fifty-seven to sixty-four minutes, respectively. In all except premature babies during the earliest weeks of life, a serum lipolytic activity lower than forty-nine minutes is considered abnormal. Low serum lipase values have been reported in a number of conditions besides tuberculosis, namely, in severe diabetes, lipemia, severe anemias, cachexia, chronic alcoholism and morphinism. The reason for the decrease in tuberculosis is not known. It may be a direct result of the tubercle toxin.

The present study was made on sixty-nine patients, most of them children. According to the clinical evidence, there were thirty-nine cases of active tuberculosis, fourteen cases of inactive or healed tuberculosis, and sixteen patients were well or suffered from a condition other than tuberculosis, such as syphilis, tetany, rickets, cyclic vomiting or malnutrition.

METHOD USED

The method used to study the lipolytic activity of the serum was that of Rona and Michaelis [10] with Falkenheim's modification. A saturated solution of tributyrin in distilled water was made, the p_H being adjusted by the addition of a one fifteenth molar solution of basic sodium phosphate to 8.3, at which serum lipase works very well.[11] The patient's blood was taken before breakfast usually, always at least four hours after the last meal, so as to avoid the effect of food ingestion on the lipolytic activity of the serum. The blood was allowed to stand for one day before the determinations were made. This was done because a constant value for serum lipolytic power is not obtained before about twenty-four hours, when it usually remains constant for several days. Previous workers have also allowed the blood to stand for one day before determining the serum lipase. One-half cubic centimeter of

9. The optimum p_H for blood lipase activity has not been determined satisfactorily. At 8.3 it acts very well and most workers use that p_H as the optimum, although Rona states that it is between 7.6 and 8.4.

10. Rona and Michaelis: Biochem. Ztschr. **31**, 1911. Rona and Ebsen: Biochem. Ztschr. **39**:21, 1912.

11. Noyes, Suguira and Falk: J. Biochem. **55**:653.

serum was added to 30 c.c. of the saturated tributyrin solution, and the surface tension of the mixture was then determined every five minutes with a stalagmometer (Traube type). The time it took for the surface tension to reach that of a half saturated tributyrin solution represented the lipolytic activity of the serum. The p_H of the serum-tributyrin mixture decreases during the determination, indicating a production of acid, so it is probable that the method measures lipase activity, but since other factors [12] in the serum may also be partly responsible for the change in surface tension, I prefer to use the term lipolytic activity.

Table 1 shows the lipolytic activity of well or nontuberculous subjects. All the values are between twenty-four and thirty-six minutes.

TABLE 1.—*Well Patients or Those Suffering from Diseases Other Than Tuberculosis*

No.	Name	Age	Lipolytic Activity in Minutes	Remarks
1	A. A.	5 months	27	Normal infant
2	G. P.	2 years	30	Had eczema, rickets and tetany
3	J. L.	2 months	32	Pharyngitis, malnutrition
4	F. B.	6 years	30	Cyclic vomiting, acidosis
5	N. A.	2½ months	33	Normal infant
6	H. A.	28 months	32	Normal infant
7	E. E.	34 years	34	Has syphilis, Wassermann 4 plus
8	A. S.	29 years	27	Well
9	B. S.	1 year	30	Normal infant
10	A. F.	7 years	27	Has endocarditis
11	A. S.	15 years	33	Had bronchitis and maxillary sinusitis; negative Manteaux and Pirquet
12	C. K.	5 months	35	Dehydrated; had gastro-intestinal intoxication
13	V. H.	29 years	27	Well
14	S. Z.	35 years	34	Has lupus erythematosis, otherwise well
15	S. B.	13 years	32	Had eczema; negative Pirquet and Manteaux; roentgenogram of chest shows diminished illumination at left apex
16	L. I.	3 years	24	Rickets

COMMENT

The lipolytic activity of the control group of cases, or nontuberculous patients, ranged between twenty-four and thirty-five minutes. Gottlieb and Falkenheim reported similar values. In all of the fourteen cases of inactive or healed tuberculosis the lipolytic power of the serum was normal except in one, Patient 11. He had some hilum gland enlargement and an old calcified lesion at the left base, but had no symptoms or signs of active tuberculosis.

Of the thirty-nine clinically active cases of tuberculosis twenty-six, or 67 per cent., had very low lipolytic activity of the serum, that is, below fifty minutes. The lowest value, 225 minutes, was obtained in

12. This possibility was suggested by Dr. Falk. Dr. Falk has studied lipase activity by measuring the amount of acid produced from a fat, but large quantities of serum would be needed for this method, and so it is not feasible in children.

TABLE 2.—*Patients with Active Tuberculosis*

No.	Name	Age	Lipolytic Activity in Minutes	Remarks
1	L. B.	13½ years	54	Had fibrous infiltration of upper two thirds of right lung and of left apex; right basal pleurisy; sputum had tubercle bacilli; temperature, 98; pulse, 90; respiration, 24
2	Q.	11 years	55	Tuberculous osteomyelitis involving several bones; also lung involvement
3	S. A.	25 years	52	Advanced tuberculosis in both lungs; cavity thickened pleura, left; negative sputum; temperature, 98; pulse, 84; respiration, 22
4	J. H.	35 years	59	Pulmonary tuberculosis, dull over upper lobes, râles over upper lobes anteriorly; also had syphilis; Wassermann, 4 plus; temperature, 98; pulse, 78; respiration, 20
5	N. C.	29 years	52	Fibrosis of both lungs, positive sputum, also tuberculous enteritis
6	N. T.	30 years	53	Tuberculous infiltration of one lobe of lung; negative sputum; temperature, normal; pulse from 80 to 92; respiration, 24
7	S. H.	56 years	64	Chronic pulmonary tuberculosis involving three lobes, also laryngeal tuberculosis; sputum positive; temperature, normal; pulse, 96; respiration, 24
8	A. H.	6 months	64	Had miliary tuberculosis; also scurvy; died three weeks after determination was made; necropsy confirmed diagnosis
9	W. H.	1 year	72	Had tuberculids, fever and positive Pirquet; developed miliary tuberculosis, then tuberculous meningitis and died three weeks later; necropsy was performed
10	L. B.	15 years	75	Very active tuberculosis of lungs, sputum positive, left apex infiltrated; pneumothorax done and patient improved *
11	D. R.	46 years	73	Moderate tuberculous infiltration of both lungs; bronchiectasis and cavity; negative sputum; temperature, pulse and respiration were normal
12	J. M.	56 years	84	Two lobes involved in tuberculous process; cavity; negative sputum; temperature, 99.4; pulse, 96; respiration, 24
13	W. R.	56 years	80	Pulmonary tuberculosis involving three lobes; two cavities; temperature, normal; pulse, 104; respiration, 28
14	I. H	23 months	83	Had tuberculous meningitis; died
15	R. K.	1 year	94	Tuberculous meningitis; died day following determination
16	A. V.	30 years	100	Pulmonary tuberculosis involving three lobes; positive sputum; cavity; no fever
17	R. R.	62 years	128	Pulmonary tuberculosis, two lobes involved; sputum positive; emaciated; temperature, 100; pulse, 84; respiration, 24
18	L. M.	61 years	134	Chronic fibroid tuberculosis; also caseation and cavity formation; negative sputum; temperature, 99.4; pulse, 96; respiration, 24
19	M. K.	44 years	137	Chronic pulmonary tuberculosis involving two lobes; positive sputum; also tuberculous laryngitis and orchitis
20	D. R.	46 years	136	Cough, loss of weight, pain in chest; dulness and decreased breath sounds over upper lobes; temperature, normal; pulse, 90; respiration 20
21	S. T.	35 years	144	Moderately advanced lesions in right upper lobe; negative sputum; temperature, 98.7; pulse, 92; respiration, 28
22	W. H.	28 years	164	Pulmonary tuberculosis, three lobes involved; cavity; temperature, 100; pulse, 90; respiration, 24
23	A. C.	Adult	170	Pulmonary tuberculosis, positive sputum, three lobes involved; temperature, 102; pulse 118; respiration, 27
24	H. H.	21 years	176	Pulmonary tuberculosis, positive sputum, three lobes involved; one cavity; temperature, normal; pulse, 96; respiration 24

* Patient 10 had an artificial pneumothorax produced and improved remarkably. Her sputum became free of tubercle bacilli, she gained weight and her temperature and pulse became normal. Her serum lipolytic activity was determined three months later and was found to be thirty minutes, showing a remarkable gain of forty-five minutes.

TABLE 2.—*Patients with Active Tuberculosis—(Continued)*

No.	Name	Age	Lipolytic Activity in Minutes	Remarks
25	L. S.	40 years	195	Pulmonary tuberculosis, one lobe involved; thickened pleura; temperature, 99; pulse, 90; respiration, 24
26	P. C.	60 years	225	Chronic fibroid tuberculosis; loss of weight, slight fever, pain in back, râles and cavernous breathing over apexes; also dulness over apexes; temperature, normal; pulse, 98; respiration, 24
27	T. C.	16 months	30	No signs of activity other than a positive Pirquet
28	S. P.	7 years	30	Pleurisy, left side, dry; positive Pirquet; temperature, 100; pulse, 104; respiration, 24
29	R. P.	11 years	34	Tuberculous lymphadenitis; incipient hilum tuberculosis; negative sputum; temperature, 101
30	A. F.	5 years	34	Tuberculous lymphadenitis, keratitis and blepharitis; treated with old tuberculin
31	N. G.	48 years	36	Chronic pulmonary tuberculosis, two lobes involved; lost much weight and had had a slight afternoon fever but not in the two weeks preceding date determination was made on
32	S. G.	30 years	37	Incipient tuberculosis of lungs?; sputum negative; physical examination of chest negative; roentgen ray shows area in left apex suspicious of tuberculosis; temperature, normal; pulse, 104; respiration, 28
33	E. F.	5 years	38	Tuberculous keratitis; positive Pirquet; hilum glands enlarged
34	J. S.	3 years	24	Tuberculous lymphadenitis; positive Pirquet
35	R. T.	1 year	25	No signs of activity other than a positive Pirquet
36	J. P.	28 years	41	Incipient tuberculosis?; hemoptysis; sputum negative; no fever; roentgen ray suspicious of tuberculosis at right apex
37	L. K.	9 years	41	Hilum tuberculosis; sputum negative; treated with tuberculin
38	L. K.	18 months	44	Tuberculous abscess of jaw
39	G. J.	10 years	46	Incipient tuberculosis; pulmonary examination negative except for positive d'Espine sign; fever to 100.6, positive Pirquet; roentgen ray of chest suggests healed focus of tuberculosis in right lung

Patient 26, who had a chronic fibroid tuberculous process of the lungs. It will be noticed that the lower values were obtained in patients with caseation and cavitation. Kollert and Frisch found that the chronic cases of tuberculosis showed the most diminished lipase activity. Patient 31 is an exception, however. He had an active chronic pulmonary tuberculosis with a normal serum lipolytic activity. Also of special interest are Patients 1, 5 and 7 who, despite extensive tuberculosis, had only slightly decreased serum lipolytic power. In acute cases of tuberculosis, such as miliary or meningeal tuberculosis, the lipolytic activity of the serum is diminished but not considerably. In the four such cases studied, Cases 8, 9, 14 and 15 of Table 2, the serum lipolytic activity ranged between sixty-four and ninety-five minutes.

Nine of the thirty-nine patients with clinically active tuberculosis, or 23 per cent., had normal lipolytic activity of the serum. Two of these, Cases 27 and 35, were placed in the active group only because they had a positive Pirquet skin test and were under 2 years of age. The absence of diminished serum lipolytic power in Case 39, who had incipient tuberculosis, might indicate that his resistance is good or that there

is no great toxicity. Neumann [13] has made the interesting observation that the tubercle bacillus is less resistant when its waxy envelope is partly dissolved. It will be noted that four of the patients with active tuberculosis and a normal serum lipolytic activity had a nonpulmonary type of tuberculosis, lymphadenitis or keratitis.

Four patients with active tuberculosis, or 10 per cent., had serums the lipolytic power of which ranged between forty-one and forty-six minutes. It is doubtful if these can be considered abnormally low values, although

TABLE 3.—*Cases of Inactive or Healed Tuberculosis*

No.	Name	Age	Lipolytic Activity in Minutes	Remarks
1	K. L.	2½ years	35	Positive Manteaux; microcephalus; congenital cardiac
2	R. R.	2¼ years	35	Positive Pirquet; healed mediastinal tuberculosis; convulsions on admission; temperature, 100; diagnosis of tuberculous meningitis thought of then in view of known previous tuberculosis but later discarded; patient recovered
3	A. S.	4 years	30	Well; had positive Pirquet; no symptoms; roentgen ray of chest negative
4	B. S.	11 years	34	Tuberculous lymphadenitis; healed clinically
5	G. L.	9 years	36	Tuberculous lymphadenitis; inactive clinically
6	J. K.	7 years	30	Healed left upper lobe lesion of tuberculosis; positive Pirquet
7	L. Z.	13 years	49	Fibrosis right apex; positive Pirquet; inactive
8	A. F.	16 years	40	Fibrous infiltration of two lobes; arrested; sputum negative; temperature, 98; pulse, 78; gaining weight
9	P. L.	13 years	30	Positive Pirquet; incipient tuberculosis?; roentgen ray of chest negative; had impaired resonance over right apex; temperature, pulse and respiration normal
10	M. A.	4 years	36	Positive Pirquet; otherwise well
11	L. G.	8 years	54	Old calcified tuberculous focus at left base; incipient hilum tuberculosis?; inactive clinically
12	G. G.	8 years	39	Positive Pirquet; healed tuberculous lymphadenitis; also had syphilis and keratitis
13	L. P.	13 years	38	Positive Pirquet; mitral regurgitation; roentgen ray of lungs negative
14	R. V.	23 years	29	Healed chronic pulmonary tuberculosis; no fever; sputum negative; had chronic endocarditis also

it is possible that as these patients improve the values will approach thirty minutes. Patient 10 is of special interest. Her condition was very poor when her serum had a lipolytic activity of seventy-five minutes. A pneumothorax was induced and she improved steadily, stopped coughing, the sputum became free of tubercle bacilli, she gained weight and the fever disappeared. In three months her serum lipolytic power had improved to thirty minutes. Case 2 of Table 3 was suspected of tuberculous meningitis when admitted to the hospital, but it soon became evident that his convulsions were not meningeal in origin. His serum

13. Neumann and Matson: Beitr. z. klin. d. Tuberk. **24**:79.

lipolytic activity was tested on admission and was found to be normal. Patient 8 of Table 2, however, was not suspected of tuberculosis until the low lipolytic activity of her serum suggested the diagnosis. Prior to that, it was thought she had pneumonia and rickets.

CONCLUSIONS

1. In the majority of cases of active tuberculosis in children and in adults, there is a lowered lipolytic activity of the serum.

2. No absolute rule can be made for determining the prognosis of a given case of tuberculosis from the value of the serum lipolytic activity, but in general the greater the severity of the tuberculosis the lower is the lipolytic activity of the serum.

3. There are occasions when the knowledge of the lipolytic power of the serum may help one in diagnosis.

39 East Sixty-First Street.

GOITER INCIDENCE IN SCHOOL GIRLS OF NEW YORK CITY*

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Before Marine and Kimball [1] published their report of the incidence and types of thyroid enlargement in school children of Akron, Ohio, in 1917, very little, or no work, had been done on the subject among school children in the United States.

Their report stimulated other investigators to estimate the thyroid incidence in school children in other sections of the country, the non-goitrous as well as the goitrous regions, and to outline methods for prevention and for cure. Reports of these surveys (Table 1) indicate that the so-called goiter belt was not limited to the Great Lakes region, but that it extended throughout the United States, in varying degrees of severity depending on geographic location. The incidence was higher in some places and lower in others, but the average is considerably higher than was thought to be the case before Marine's statistics were published.

GOITER SURVEYS: INCIDENCE AMONG SCHOOL CHILDREN

Most investigators have confined their investigations of thyroid incidence to children of school age, while a few have included young adults.

Luck,[2] at the University of Indiana, showed that approximately 30 per cent. of the girls examined had enlarged thyroid glands. Gilder [3] investigated the thyroid glands in the women in the class of 1924, University of Illinois, and found that one half of them had enlargement of the thyroid gland. Olsen,[4] in tests made in the Great Lakes Basin, found an average of 17.8 per cent. of the women and 6.7 per cent. of the men affected. Hall [5] made a study of 3,339 students at the University

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* From the Division of Educational Hygiene, Department of Education.

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1. Marine, David, and Kimball, O. P.: Prevention of Simple Goiter, J. Lab. & Clin. Med. **3**:40-48 (Oct.) 1917.

2. Luck, F. H.: Goiter at Indiana University, J. Indiana State M. A. **17**:183-184 (June 15) 1925.

3. Gilder: Interesting Goiter Statistics, Indianapolis, Eli Lilly Co., June, 1924.

4. Olsen, E. T.: Goiter, Its Prevention in Chicago as Shown by the Examination of 800 Individuals, Illinois M. J. **27**:16 (Jan.) 1915.

5. Hall, D. C.: The Prevalence of Goiter in the North West, Based on the Examinations of 3,339 Students Entering the University of Washington, Northwest. Med. **6**:189, 371, 1914.

of Washington. Of the 1,253 women students in this group (average age 19 years and 3 months), he found 31 per cent. with enlarged thyroid glands: 23.5 per cent. were classified as perceptible, 6.8 per cent. as medium and 0.7 per cent. as large. Clark and Pierce [6] examined 13,836 school children in eleven counties of West Virginia, and found 1,234 subjects (or 9 per cent.) with goiter. In Virginia, the same worker

TABLE 1.—*Summary of Goiter Surveys*

Investigator	Location	Number Examined	Percentage Incidence			Remarks
			Children	Boys	Girls	
Luck	Univ. of Indiana	.....	....	....	30.0	Older age group
Gilder	Univ. of Illinois	Class of 1924	....	....	50.0	
Olsen	Great Lakes Basin	.....	....	6.7	17.8	
Hall	Univ. of Washington	3,339	....	....	31.0	Aver. age 19 yrs. 3 mos.
Clark	West Virginia	13,836	9.0	....	....	
Clark	Virginia	6,432	....	0.1	12.0	
Lamel (Med. Klin. **20**:212, 1924)	Berndorf	.....	....	....	20.0	1922
Lamel (Med. Klin. **20**:212, 1924)	Berndorf	.....	....	....	46.0	1923; rare under 6 yrs. of age
Reed and Clay	Grand Rapids	25,215	....	32.0	67.0	Peak at 14 yrs.
Watt (J. M. A. Georgia)	West Virginia	.....	....	....	50.0	
Marine-Kimball	Akron, Ohio	5th to 12th grades	....	....	56.4	
Wheelon	Seattle	.....	....	41.5	47.7	Ages 6 to 14 yrs.
Klinger	St. Gall, Switz.	All schools	....	....	87.6	Dropped to 13.1 per cent. in 4 yrs. after iodin treatment
Franck	Kiel	5,058	....	1.3	10.0	
Franck	Tubingen	566	....	15.0	30.6	
Kraeutner (München. med. Wchnschr. **69**: 47, 1922)	Munich	1,940	....	....	62.5	Ages 14 to 15 yrs.
Levin (Arch. Int. Med. **27**: 421, 1921)	Houghton Co., Mich.	480	....	....	80.0	Ages 6 to 16 yrs.
Marine-Kimball	Cleveland	.....	....	....	43.7	1917; ages 10 to 12 yrs.
Olesen	Cincinnati	47,490	32.2	26.6	39.8	Greatest prevalence between 11 and 13 yrs.
Foard	Montana	13,937	21.6	13.4	32.0	1922-1923 included definitely enlarged goiters only
	Wellesly College	.....	....	....	16.0	Older age group
	Univ. of California	.....	....	....	17.0	Older age group
	Univ. of Wisconsin	.....	....	....	38.0	Older age group
Palmer	Syracuse	25,875	18.0	....	....	Small goiters most prevalent
Utah State Board of Health (J. A. M. A. **84**: 10, 1925)	Utah Co. (5 towns)	30,413	....	36.4	59.9	1925 ages between 10 and 14 yrs.

examined 6,432 school children and found 12 per cent. with goiter. In the Virginia survey, less than 0.1 per cent. of the goiters found were in the boys. Reed and Clay [7] examined 26,215 pupils of the Grand Rapids schools, and found that 30 per cent. of them had enlargement of the thyroid gland. Among the high school students, including boys

6. Clark, T., and Pierce, C. C.: Endemic Goiter, Its Possible Relation to Water Supply, Pub. Health Rep. **29**:939, 1914.

7. Reed, T., and Clay, H. T.: A Survey of Thyroid Enlargement Among the School Children of Grand Rapids, J. Michigan M. Soc. **22**:323 (Aug.) 1923.

and girls, the incidence was higher. In the total number examined, there were about twice as many enlargements in girls as in boys: in the children over 10 years of age, the ratio was about two and a half times as many in girls as in boys, and in those under 10, less than twice as many. Their investigation showed a gradual increase in the goiter incidence from the age of 5 to 14, the peak occurring at 14 years.

In 1917, 56.4 per cent. of the girls in the fifth to twelfth grades in Akron, Ohio, showed some degree of enlargement, according to Marine and Kimball.[1] Wheelon [8] quotes Hall's figures (compiled in 1921) for school children in and about Seattle. Goiter was present in 41.5 per cent. of the boys and in 47.7 per cent. of the girls between the ages of 6 and 14. After the twelfth year, there was a greater incidence in girls. In one high school, Hall observed thyroid enlargement in 38.3 per cent. of 575 boys and in 65.6 per cent. of 521 girls. In 1918, goiter was present in the school children in the canton of St. Gall, Switzerland, to the extent of 87.6 per cent. In January, 1922, after iodin treatment, it had dropped to 13.1 per cent.

Franck [9] gives figures from Kiel and Tubingen. In Kiel, of 5,058 girls between the ages of 7 and 15 years, 10 per cent. showed goiter; of 771 boys of the same ages, 1.3 per cent. showed goiter. In Tubingen, of 581 girls, aged from 11 to 13 years, there was a percentage of 30 per cent.; of 77 boys, aged from 10 to 13 years, there was an incidence of 15.5 per cent.

Marine and Kimball [10] found the following figures for Cleveland: In 1917, 43.9 per cent. of the girls in the 10 to 12 years of age group and 58.7 per cent. of the girls in the 12 to 14 years of age group showed enlargement. In 1918, 35.8 per cent. in the younger group and 50 per cent. of the older group showed an enlargement. In 1919, 23.2 per cent. of the first group and 38.2 per cent. of the second group showed thyroid enlargement. They take these figures to show the importance of the age at which prophylactic treatment should be started. It is of interest to note that in one lake county in Michigan with practically no iodin in the water, the goiter incidence was 70 per cent.; in two inland counties, where the iodin content was 12 parts per hundred billion of water, goiter averaged 32 per cent. South of Detroit, where water iodin is 60 parts per hundred billion, goiter averages 26 per cent. in school children.

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8. Wheelon, Homer: The Incidence of Endocrinopathies in the Puget Sound Basin, Endocrinology **7**:689 (Sept.-Nov.) 1923.

9. Franck, Herman: Goiter in School Children in Kiel and Tubingen, Deutsch. med. Wchnschr. **49**:1084 (Aug. 17) 1923.

10. Marine, David and Kimball, O. P.: Prevention of Simple Goiter in Man, Arch. Int. Med. **25**:661 (June) 1920.

Sloan [11] gives a graph showing the incidence of endemic goiter in the United States by locality and says:

> In the United States the distribution of endemic goiter very slowly follows the terminal moraine of the third glacial epoch extending from the St. Lawrence Basin, along the southern extent of the Great Lakes' watershed, and thence following roughly a general westerly direction to the Pacific Ocean. The highest percentage is among the inhabitants of the Northwest corner, Washington, Oregon and Idaho.

In his thyroid survey of school children in Cincinnati, Olesen [12] found that of 47,493 school children examined between the first and the eighth grades, 15,751 (or 32.2 per cent.) of the children had thyroid enlargements. The period of greatest prevalence was between the ages of 11 and 13 years. In 142 instances, representing 0.9 per cent. of the enlargements, a presumptive diagnosis of adenoma was recorded. Only one frank case of exophthalmic goiter was noted, and this was in a girl, age 13, who was under medical supervision. Tentative diagnoses of exophthalmic goiter were made in three other girls.

Foard [13] reported a study of the prevalence of thyroid enlargement among school children in Montana during the school year of 1922 to 1923. The study comprised the examination of 13,937 children; 3,011 simple goiters were found, an incidence of 21.6 per cent. The children were of all ages, ranging from 6 to 20 years, and in 4,690 of them, carefully classified by sex, goiter incidence in girls was 32 per cent. and in boys 13.4 per cent., a ratio of 2.4 to 1. A review of the literature discloses that thyroid enlargement occurs more frequently in girls than in boys, the ratio being anywhere from 1:1 to 10:1.5. His conclusion was that the thyroid enlargement in school children of the rural schools varied with the degree of isolation of the school district. Thyroid enlargement was decidedly more prevalent in the isolated rural districts than in the towns and cities.

WHAT IS SIMPLE GOITER?

According to Gould [14] and to Dorland: [15] "goiter is an enlargement of the thyroid gland." Stedman [16] amplifies this definition by stating that:

> Goiter is a chronic enlargement of the thyroid gland not due to a neoplasm, occurring endemically in certain localities, especially mountainous regions, and sporadically elsewhere.

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11. Sloan, H. G.: Solution of the Endemic Goiter Problem, South. M. J. **15**:202 (March) 1922.
12. Olesen, R.: Thyroid Survey of 47,493 Elementary School Children in Cincinnati, Pub. Health Rep. **39**:1777 (July 25) 1924.
13. Foard, F. T.: Thyroid Enlargement Among Montana Schoolchildren, Pub. Health Rep. **39**:2354 (Sept. 12) 1924.
14. Gould, George M.: The Practitioner's Medical Dictionary, Ed. 3, 1923.
15. Dorland, W. A. N.: Medical Dictionary, Ed. 12, 1923.
16. Stedman, T. L.: Medical Dictionary, Ed. 4, 1916.

Hunziker [17] has pointed out that: "The size of a normal thyroid is not known, and for that reason no one can state where the normal thyroid stops and goiter begins." According to Plummer: [18] "Excessive storage of colloid, to a degree of making the human thyroid easily palpable, is accepted as abnormal."

Marine [1] says that goiter means: "A hyperplasia of the thyroid gland. It does not necessarily mean exophthalmic goiter, although many cases with simple goiter may later develop exophthalmic goiter." He applies the term simple goiter to: "Those thyroid enlargements formerly designated as endemic, epidemic, sporadic, physiologic or adolescent goiters."

According to the majority of investigators, simple goiter is one of the most benign and insidious diseases of man, and according to Marine [1] it is probably the easiest of all known diseases to prevent.

THE ETIOLOGY OF SIMPLE GOITER

It may be said, parenthetically, that the thyroid gland exercises an influence on the growth of the skeleton and on the activity of all the body tissues, including those of the central nervous system. The thyroid, with other glands of internal secretion, influences the secondary sex characteristics and mature sexual life (which explains thyroid enlargement during such periods as fetal life, puberty, pregnancy and menopause), and through its secretion, a hormone (thyroxin) containing iodin controls the body metabolism. Iodin is stored in the thyroid gland.

Although the essential cause of simple goiter is unknown, the immediate cause is a relative or an absolute deficiency in iodin, in other words, iodin starvation. McClendon and Williams [19] state that: "Goiter develops when the iodin content of the thyroid gland falls below one-tenth of 1 per cent. of the total dried substance. Active hyperplasia of the thyroid gland begins when the minimum is reached." As long as the thyroid gland contains its normal amount of iodin there is no tendency toward hyperplasia or thyroid enlargement. Nature provides sources of iodin in its waters, salt and sea foods. Localities near sea coasts obtain an additional small amount of iodin from the air. When the supply of iodin from these sources is diminished below one-tenth of 1 per cent., a compensatory swelling of the thyroid gland is evidenced, to which the name simple goiter has been applied. Such simple, endemic,

17. Hunziker, Heinrich: Die Prophylaxe der Grossen Schilddrüse Gleischzeitig Ein Stück Vergleichende Klimatologie der Schweiz und Ein Leitfaden für Systematische Naturwissen-schaftliche Forschungen, Leipsic, Ernst Bircher, 1924.

18. Plummer, H. S.: Oxford Med. **3**:851, 1921.

19. McClendon, J. F., and Williams, Agnes: Simple Goiter as a Result of Iodin Deficiency, J. A. M. A. **80**:600 (March 3) 1923.

sporadic or colloid goiters are associated with certain regions—districts of glacial formation in contradistinction to districts of nonglacial formation.

Many surveys of the country have been made with respect to this geologic formation. By maps of the United States, McClendon and Hathaway [20] have shown that goiter is most prevalent in those areas (glacial districts) wherein the iodin content of the water and soil is deficient. They have found also that incidence of goiter increases in a district of glacial formation from the periphery toward its center, because the iodin supply from natural sources is greater at the periphery than in the center. Von Tellenberg [21] has arrived at the same conclusion after a similar study of Switzerland. Because of its location on the sea coast, New York City has been considered a nongoitrous locality. Its water supply contains from 110 to 250 parts of iodin per hundred billion parts of water, whereas in goitrous regions the iodin content ranges between 2 (Michigan) and 21 (Ohio) parts per hundred billion parts of water.

Simple goiter may result from:

1. An actual insufficiency of iodin ingestion to meet the ordinary demands of normal thyroid function. In this group may be placed those individuals who live in goitrous districts.

2. An increase in the needs of the organisms for the iodin containing hormone, in excess of the amount necessary to meet the ordinary demands made of the normal thyroid function, as during the fetal period, pregnancy, puberty and at menopause, and during certain systemic infections and intoxications. This state may explain the occurrence of simple goiters among people of a nongoitrous district.

3. An interference with the absorption and utilization of the normal intake of iodin, and,

4. An actual deprivation of iodin, such as through improper diet rich in fats.

It may be said, then, without fear of contradiction, that:

Simple goiter is a compensatory hyperplasia of the thyroid gland developing during the course of certain metabolic disturbances of unknown origin, but immediately dependent on a relative or an absolute deficiency of iodin. Whether the deficiency is primary, or secondary, is unknown. When one recalls that 50 mg. of iodin will maintain the thyroid in a normal state for as long as a year, and that diets rich in fat can quickly exhaust the iodin of the thyroid, it would appear that the iodin deficiency might be considered as the primary, and possibly as the essential, cause of simple goiter. Nevertheless, we must still

20. McClendon, J. F., and Hathaway, J. C.: Inverse Relation Between Iodin in Food and Drink, and Goiter, Simple and Exophthalmic, J. A. M. A. **82:** 1668 (May 24) 1924.

21. Von Tellenberg, T.: Mitt. A. D. Geb. d. Lebensmitteluntersuchung. u. Hyg. **14:**161, 1923.

consider the possibility of endemic goiter being due to some chemical agent or toxin acting to divert the normal iodin intake, or to increase the needs of the organism for thyroid activity.[22]

Fatigue may directly or indirectly produce this need.

THYROID SURVEY OF 11,084 SCHOOL GIRLS OF NEW YORK CITY

This present survey was undertaken primarily for the purpose of determining the extent, type and degree of thyroid involvement in a cosmopolitan group of girls of school age residing in a known non-goitrous district. In the latter respect, the present survey differs from the previous studies by other investigators who surveyed districts of known endemic origin. If an incidence were established, the results could be used for the recommendation of prophylactic and curative measures.

For the last five years, although it has been our experience that enlarged thyroids were present in the young women entering training schools for teachers, it was not until the spring of 1924 that a systematic survey was undertaken to determine the true state of affairs.

The 11,084 children observed were selected at random from seven schools, and one miscellaneous group (graduates of high schools from Manhattan and The Bronx, private schools and out of town high schools). For the purpose of classification, they may be grouped as follows: (*a*) Children attending elementary schools and (*b*) high schools; (*c*) young women entering the junior year of the New York Training School for Teachers.

The schools included in the survey were: Washington Irving High School;[23] Evander Childs High School; Morris High School; Walton Junior-Senior High School; New York Training School for Teachers; Public School 96, Manhattan;[23] Public School 119, Manhattan;[23] Public School 45, The Bronx.

GENERAL CONSIDERATIONS

A special record card (Fig. 1) was given to each pupil by the class teacher, with instructions to insert the preliminary information on the card above the double-ruled lines. These cards were presented by the individual pupils to the examining physician at the time of the examination. It should be noted that no reference was made on the card to the nature of the examination or investigation, because we wanted the survey conducted without causing anyone undue emotional or nervous strain.

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22. Marine, David; Lenhart, C. H.; Kimball, O. P., and Rogoff, J. M.: The Prevention of Simple Goiter, West. Reserve, Univ. Bull. **26** (July) 1923.

23. The girls of these schools were examined by Dr. Frances Cohen, Assistant Director of Educational Hygiene, Board of Education, City of New York.

As the children formed in line, each child was examined individually, and the findings called out to the teacher who recorded the findings. The symbols 0-1-2-3 were used to describe the size of the gland, and when exophthalmos, tremor or mottling was noticed, the teacher's attention was called to it for the purpose of record. No previous estimate of

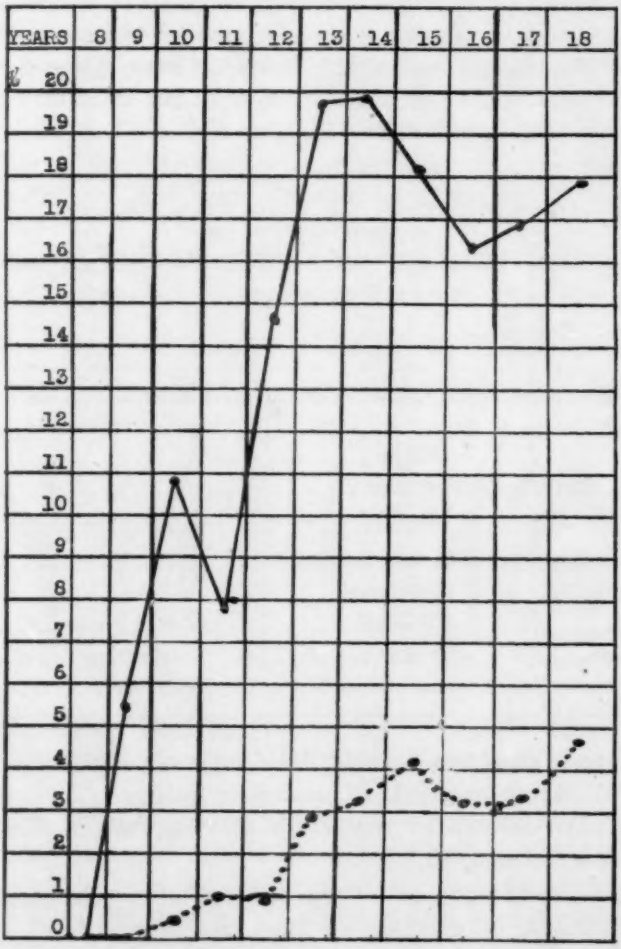

Fig. 1.—Thyroid incidence according to age in white girls. Straight line, slightly enlarged; dotted line, moderately and markedly enlarged.

the physical development of the children examined was undertaken in connection with this study.

A study of the thyroid incidence was made according to the age and race of the pupil, menstrual history, the number of years of residence in New York City, the birthplace of the child's mother, and associated signs of goiter.

STANDARDS FOR RECORDING THYROID ENLARGEMENT

Since the determination of the degree of thyroid enlargement is a matter of individual judgment, it was felt that if but two examiners were to pass judgment on the state of the thyroid, the error in judgment would be small. In other words, a course of prearranged standards was pursued. The data presented represent a minimum rather than a maximum prevalence of thyroid enlargement, for they include only definitely enlarged and palpable thyroids. In no case was a thyroid gland considered slightly enlarged if either of the examiners hesitated to place it in that classification.

BOARD OF EDUCATION OF THE CITY OF NEW YORK
DEPARTMENT OF
PHYSICAL TRAINING AND EDUCATIONAL HYGIENE

GRADES.....Dates.....

P.S..... Borough.....

.....

Name..... Race.....

City.....State.....

Age..... Birthplace of: { Child ..... / Father ..... / Mother .....

Years in New York City.....Previous Residence.....

0 Normal .....2 Moderate .....Tract .....

1 Slight .....3 Marked .....Rec. Illness .....

Exophthal.....Tremor .....Mottling .....

M. Present.....Due one week.....Never .....

The thyroid gland was examined from the standpoint of size, whether normal (0), slightly enlarged (1), moderately enlarged (2), or markedly enlarged (3). Associated signs such as exophthalmos, tremor and mottling were also noted.

Normal Thyroid Glands.—These included all thyroid glands which were not palpable or in which the lobes and isthmial band were just detectable on palpation. Border-line cases, or those in which doubt existed as to whether they were normal or slightly enlarged, were discarded and called normal in the interest of accuracy.

Slight Enlargements.—These included the subjects with visible fulness over lobes and isthmial band, and those whose glands were more definitely enlarged, and more easily palpable than in the normal group. A definite mass was palpable both when the child was quiet, and when the child swallowed.

Moderate Enlargements.—These included the glands with bulging of the neck laterally from the enlarged lobes and bulging anteriorly from the enlarged isthmus. In this type, the v-shaped angle between the sternocleidomastoid muscles was filled by the enlarged thyroid gland.

Marked Enlargements.—These included the glands with gross deformities, and with marked lateral and anterior bulging. In addition, there was bulging of the v-shaped angle between the sternocleidomastoid muscles.

As shown in Table 2, a total of 9,978 white girls were examined to ascertain the thyroid incidence according to age. Of the total number, 7,955, or 79.7 per cent., were classified as normal; 1,717, or 17.2 per

TABLE 2.—*Thyroid Incidence According to Age (White)*

Age in Years	Total		0 Normal		1 Slightly Enlarged		2 Moderately Enlarged		3 Markedly Enlarged	
	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total.....	9,978	100.0	7,955	79.7	1,717	17.2	254	2.6	52	0.5
8.....	19	0.2	19	100.0	.....	....	...	....	..	....
9.....	72	0.7	68	94.4	4	5.6	...	....	..	....
10.....	211	2.1	187	88.6	23	10.9	1	0.5	..	....
11.....	385	3.9	351	91.2	30	7.8	3	0.8	1	0.2
12.....	839	8.4	709	84.5	122	14.6	7	0.8	1	0.1
13.....	1,428	14.3	1,105	77.4	282	19.7	36	2.5	5	0.4
14.....	1,878	18.9	1,445	77.0	372	19.8	55	2.9	6	0.3
15.....	1,941	19.5	1,509	77.7	351	18.1	62	3.2	19	1.0
16.....	1,788	17.9	1,439	80.5	292	16.3	47	2.6	10	0.6
17.....	1,027	10.3	819	79.8	174	16.9	29	2.8	5	0.5
18.....	290	2.9	224	77.3	52	17.9	9	3.1	5	1.7
19.....	59	0.6	46	78.0	9	15.2	4	6.8	..	....
20.....	10	0.1	8	80.0	2	20.0	...	....	..	....
21.....	10	0.1	7	70.0	2	20.0	1	10.0	..	....
Not given...	21	0.2	19	90.5	2	9.5	...	....	..	....

cent., were slightly enlarged (Group 1); 254, or 2.6 per cent., were moderately enlarged (Group 2), and 52, or 0.5 per cent., were markedly enlarged.

Totalling Groups 1, 2 and 3 (representing the slightly, moderately and markedly enlarged thyroid glands), we find that 2,023 (or 20.3 per cent.) of the girls had simple enlargements of the thyroid glands. Compared with the statistics of simple goiter in children of corresponding ages in localities where simple goiter is endemic, these findings in a nongoitrous region is of particular significance. Further analysis of Table 2 shows that the curve of thyroid incidence (Fig. 2) begins at a minimum of 3.6 per cent. at 9 years of age for the slightly enlarged thyroid gland group, and gradually continues upward reaching a maximum of 19.7, 19.8 and 18.1 per cent. at 13, 14 and 15 years of age, respectively. This period represents the menstrual age of girls in New York City, and may explain the reason for the rapid rise from 14.6 per cent. (the prepubescent period), to 19.8 per cent. (the

pubescent period) when the menstrual cycle is established. On further supposition, one may add that with the cycle established, and with an equilibrium formed, the incidence of thyroid enlargement decreases gradually, and at 16 years af age, we find it at 16.3 per cent. Despite this drop of 3.5 per cent., the incidence must still be regarded as unusually high at 16.3 per cent. for a nongoitrous district, the water supply of which has an iodin content of from 110 to 250 parts per hundred billion parts of water.

Continuing the analysis of Table 2, we find, combining the moderately and markedly enlarged thyroid gland groups (Fig. 2), that the inci-

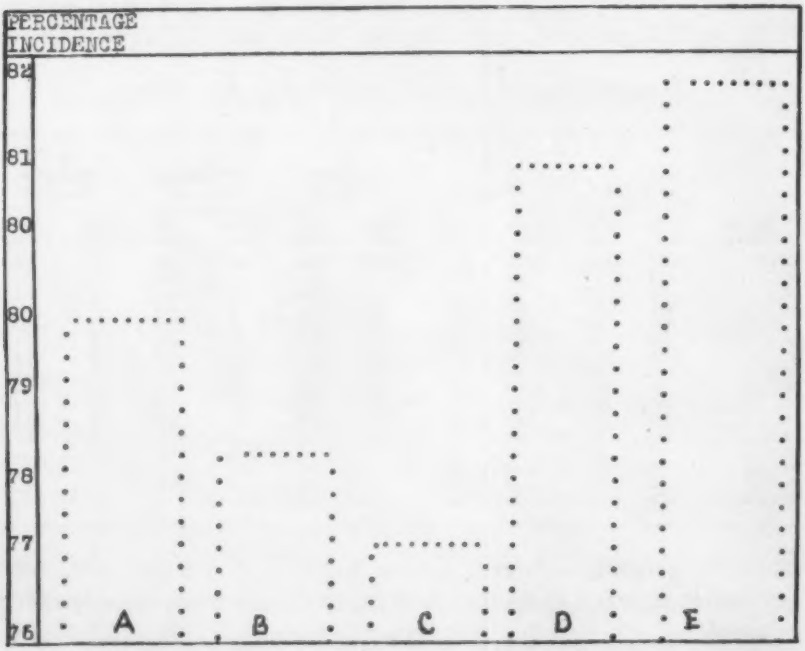

Fig. 2.—Relation between incidence of normal thyroids and menstrual function. Percentages of normal thyroid: *A*, in total group examined; *B*, with menstruation present; *C*, with menstruation due in one week; *D*, between menstrual periods; *E*, never menstruated.

dence increases gradually until a maximum of 4.2 per cent. is reached at the age of 15 years, at approximately the same age (14 years) at which the slightly enlarged group reaches its maximum. Following this maximum, we find that a decline from 4.2 to 3.2 per cent. occurs in the second group (from moderately to markedly enlarged thyroid glands) at approximately the same age as in the first group, but not to a corresponding degree (from 19.8 to 16.3 per cent., as against 4.2 to 3.2 per cent.). Since our study included only girls up to the age of 18 years (those between 18 and 21 years were excluded because they were too

few in number to be of statistical value), it would be of extreme interest and importance to have a study of this kind to include females up to the age of at least 30 years, to see whether the decline in the incidence for the moderately to markedly enlarged group continues or remains stationary.

After this report had been completed, it was learned that an investigator of one of the large life insurance companies of this city found about 3 per cent. of 1,500 women employees (between the ages of 20 and 30) of the company with enlarged thyroid glands.

A group of 1,106 negro girls was investigated to compare the incidence of thyroid enlargement in them with that in white girls (Table 3). A study of the table leads to the conclusion that enlarged thyroids are

TABLE 3.—*Relation Between Thyroid Incidence and Race*

	White	Colored
Number examined	9,978	1,106
Normal	7,955	956
Enlarged	1,717	150
Percentage normal	79.7	86.4
Percentage enlarged	20.3	13.6

TABLE 4.—*Relation Between Thyroid Incidence and Menstrual History*

	Total		Normal		Enlarged	
	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total	9,978	100.0	7,955	79.7	2,023	20.3
Menstruating at present	1,222	12.3	956	78.2	266	21.8
Due one week	2,172	21.8	1,670	76.9	502	23.1
Never	1,930	19.3	1,574	81.6	356	18.4
Not given	4,654	46.6	3,755	80.7	899	19.3

less frequently observed in negro girls, as compared to the white girls to the extent of 6.7 per cent. This observation has been noted by others.

Much has been written in explanation of the enlarged state of the thyroid and its relation to menstruation (Table 4). An effort was made to ascertain whether or not such a relationship existed. Of the girls who menstruated at the time of the examination, 78.2 per cent. had normal thyroid glands, as compared to 79.7 per cent. with normal glands in the entire group (Fig. 3). This represents a decrease of 1.5 per cent. in the incidence of normal glands at a time when the thyroid is in one of its most active stages. Of the girls who were due to menstruate within one week of the examination, 76.9 per cent. had normal glands as compared to 79.7 per cent. representing the percentage of normal thyroid glands studied in the entire group (Fig. 3). Here, again, occurs a decrease (2 per cent.) in the incidence of normal glands during the preactive stage of the menstrual cycle.

Of the girls (recorded as "not given") who at the time of the examination were not menstruating and not due to menstruate within a week, but who had previously menstruated, 80.7 per cent. had normal thyroids, as compared to 79.7 per cent. representing the percentage of normal thyroids in the entire group (Fig. 3). Where the menstrual cycle had not been established, 81.6 per cent. of the girls had normal thyroids compared to 79.7 per cent. for the entire group (Fig. 3). In the two latter groups, we meet the inactive phase of the menstrual cycle, and an increase in the incidence of normal thyroid glands.

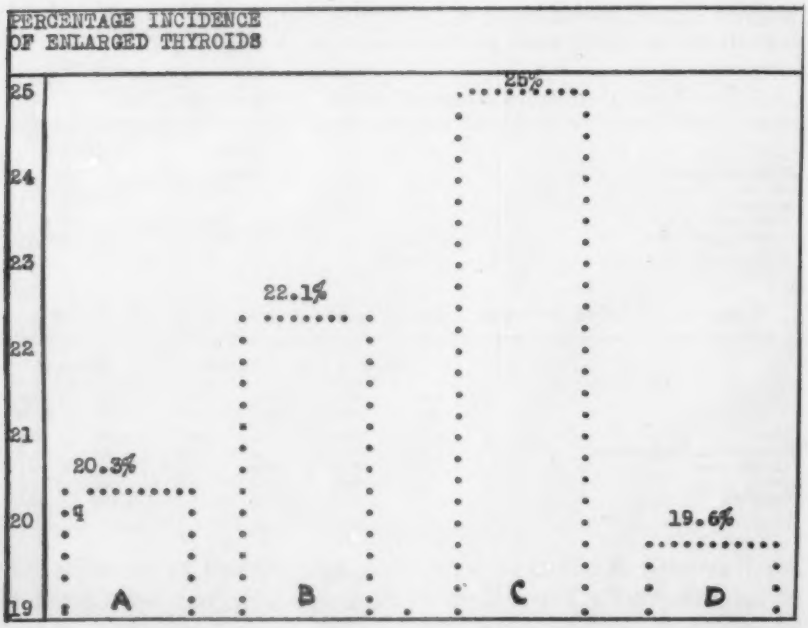

Fig. 3.—Relation between thyroid incidence and birthplace of mother. Percentage of enlarged thyroids: *A*, in total group examined; *B*, in girls whose mothers were born in New York City; *C*, in girls whose mothers were born in U. S. A.; *D*, in girls whose mothers were born abroad.

Although the study suggests that the percentage of incidence of normal glands seems to vary inversely with the activity of the menstrual cycle, our findings, based on slight differences in percentages, should not be construed as conclusive.

These so-called physiologically enlarged goiters are probably not due to menstruation itself, but rather to some metabolic disturbance of unknown origin, accompanied by a relative or absolute deficiency of iodin. The fact that a seasonal incidence exists in goiter lends support to this contention.

Very little light was shed on the incidence of thyroid enlargement, based on the number of years' residence in New York City (Table 5). All of the children had resided in the city for at least one year prior to the time of the examination. Sufficient time had elapsed, therefore, to expose these children to conditions which might possibly contribute to thyroid enlargement.

TABLE 5.—*Relation Between Thyroid Enlargement and Number of Years in New York City*

Number of Years in New York City	Total		Normal		Enlarged	
	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total	9,978	100.0	7,955	79.7	2,023	20.3
1	47	0.6	31	66.0	16	34.0
2	91	0.9	70	76.9	21	23.1
3	150	1.5	97	64.7	53	35.3
4	115	1.2	90	78.2	25	21.8
5	106	1.1	87	82.0	19	18.0
6	87	0.9	63	72.4	24	27.6
7	99	1.0	81	81.8	18	18.2
8	134	1.3	106	79.1	28	20.9
9	182	1.8	159	82.4	23	12.6
10	443	4.4	367	82.8	76	17.2
11	536	5.4	469	87.5	67	12.5
12	963	9.5	799	82.8	164	17.2
13	1,344	13.5	1,038	77.2	306	22.8
14	1,574	15.8	1,229	78.1	345	21.9
15	1,517	15.2	1,200	79.1	317	20.9
16	1,344	13.5	1,077	80.1	267	19.9
17	763	7.6	617	80.9	146	19.1
18	200	2.0	154	77.0	46	23.0
19	32	0.3	26	81.3	6	18.7
20	5	0.0	4	80.0	1	20.0
21	6	...	5	83.3	1	16.7
Not given	256	...	196	78.4	54	21.6

TABLE 6.—*Relation Between Thyroid Incidence and Associated Signs*

	Total		Normal		Enlarged	
	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total	4,654	100.0	3,630	78.0	1,019	22.0
Tremor	138	3.0	9	6.5	129	93.5
Mottling	186	4.0	34	18.3	152	81.7
Exophthalmos	4	0.01	2	50.0	2	50.0

The study to ascertain the relationship between thyroid enlargement and associated signs such as tremor, mottling and exophthalmos was confined to the girls attending The Bronx schools (Table 6). Of the girls who showed unmistakable signs of tremor, 93.5 per cent. had enlarged thyroid glands, compared to 22.0 per cent. with thyroid enlargement in the entire group. Of the girls with mottling of the skin covering the upper thorax, 81.7 per cent. had enlargement of the thyroid glands. Four girls had exophthalmos; of these, two had had surgical treatment and did not show any evidence of enlarged thyroid glands, while the other two girls had markedly enlarged thyroids and were under special medical treatment.

Our study included an effort to determine the relationship between thyroid enlargement of the children and the birthplace of their mothers (Table 7). Of the girls whose mothers were born abroad, 19.6 per cent. had enlarged thyroid glands, compared to 20.3 per cent. in the entire group studied. Of the girls whose mothers were born in the United States (outside of New York City and State) 25.0 per cent. had enlarged thyroid glands, compared to 20.3 per cent. in the entire group studied. Of the girls whose mothers were born in New York City, 22.1 per cent. had enlarged thyroid glands, as compared to 20.3 per cent. in the entire group studied. The conclusion is that girls born of mothers of foreign birth show the least incidence of thyroid involvement.

THE TREATMENT OF SIMPLE GOITER

The efficiency of the practical application of the internal administration of iodin for the prevention of simple goiter as a public health

TABLE 7.—*Relation Between Thyroid Incidence and Birthplace of Mother*

	Total		Normal		Enlarged	
	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total	9,978	100.0	7,975	79.7	2,023	20.3
New York City	1,712	17.2	1,334	77.9	378	22.1
United States	511	5.1	383	75.0	128	25.0
Foreign country	7,720	77.4	6,206	80.4	1,514	19.6
Not given	35	0.3	32	....	3	....

measure, has been definitely established by Marine and Kimball in their classical experiment in the public schools of Akron, Ohio, in 1917.

Their observations extended over a period of four years, during which time 4,000 school girls were kept under observation. Half of these took enough iodin to saturate the thyroid twice a year, in the spring and fall; the other half took no iodin. Among those who took iodin and who had normal thyroid glands when prophylactic treatment was started, not one developed goiter, while among those who did not take iodin 27.6 per cent. developed goiter. Moreover, in more than 60 per cent. of those who had enlarged thyroid glands and who took iodin systematically, the thyroid gland returned to normal size; while in comparatively few of those with enlarged thyroids who did not take iodin did the enlarged thyroid gland show any tendency to decrease in size.

The solution of this interesting problem in preventive medicine has caused definite measures to be directed toward the prevention of simple goiter among school children in many cities throughout this country and abroad.

Following their successful efforts, Klinger[24] of Zurich, Switzerland, undertook the same treatment in the schools there in 1918. After three years' work, he reported a reduction in the incidence of endemic goiter from 87.6 per cent. in January 1918, to 13.1 per cent. in January, 1922, in spite of the fact that he was working in some schools in which children were 100 per cent. goitrous. Because of these extraordinary results, the Goiter Committee of Switzerland recommended that the iodin method of goiter prevention be instituted as a public health measure throughout the entire city, which is regarded as the most noted endemic goiter district in the world. In place of sodium iodid which was used in the Akron schools, Klinger employed an organic iodid, called iodostarin, in 5 mg. doses, once a week throughout the school year. Iodostarin is a chocolate tablet which has been used extensively in this country and abroad, and which has done much to increase both the efficiency and the popularity of goiter prophylaxis.

Lenhart and Rogoff, McCarrison,[25] Weith,[26] Sloan,[27] Hirschfelder,[28] Wagner-Jauregg,[29] Crile,[30] Palmer,[31] Keith,[32] Rosenblüth and others[33] agree with Marine and Kimball that iodin is a specific for simple goiter, and stress prophylaxis rather than cure.

The time for instituting prophylactic treatment is an important consideration. From practical observations and experiments, it is known that in the great majority of cases of goiter, thyroid enlargement starts as a congenital defect or begins at puberty or during pregnancy. These periods of life are therefore the most important to consider in relation to the prevention of simple goiter. It follows then, that if during the last two or three months of pregnancy the mother's thyroid glands were kept saturated with iodin, the tendency to thyroid enlargement in two of these periods would be controlled. In addition, if the thyroid

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24. Klinger, R.: Prevention of Goiter in School Children in Zurich, Schweiz. med. Wchnschr. **51**:12 (Jan. 12) 1921.

25. McCarrison, Robert: Simple Goiter, Brit. M. J. **1**:636 (April 22) 1922.

26. Weith: Goiter and Iodin in the Schools, Cor. Bl. f. schweiz. Aertze **49**: 1474 (Sept. 25) 1919.

27. Sloan, H. G.: Use of Iodized Salt to Prevent Goiter, Ohio State M. J. **17**:172 (March) 1921.

28. Hirschfelder, A. D.: A Simple Method for the Administration of Iodids in Food in the Goitrous Regions, J. A. M. A. **79**:1426 (Oct. 21) 1922.

29. Wagner-Jauregg: Treatment and Prophylaxis of Goiter, Wien. klin. Wchnschr. **36**:139-156 (Feb. 22) 1923.

30. Crile, George W.: Certain Problems in the Treatment of Diseases of the Thyroid Gland, J. A. M. A. **83**:813 (Sept. 13) 1924.

31. Palmer, M. B.: Endemic Goiter, Its Prevention, J. A. M. A. **82**:1568 (May 10) 1924.

32. Keith, W. D.: Endemic Goiter, Canad. M. A. J. **14**:279-362 (April) 1924.

33. Rosenblüth, A.: A Year of Goiter Prevention, Wien. klin. Wchnschr. **37**:598 (June 12) 1924.

glands were saturated with iodin during the adolescent period "simple goiter," according to Marine, "would be the easiest of all known diseases to prevent."

What has been said in regard to prophylactic treatment applies equally as well to curative treatment, except perhaps that instead of giving 5 mg. of organic iodin, the dose is increased to 10 mg. once or twice a week, until the size of the thyroid gland returns to normal. After that, the prophylactic dose should be administered once a week, with intermissions between seasons. Whether or not the treatment of simple goiter should be conducted as a public health measure or carried out by individual physicians, depends on the incidence and the type of goiter prevalent in a locality.

The consensus of opinion is that in endemic goitrous regions, the prophylaxis of simple goiter should be administered by local and by state health departments as a public health measure, whereas in communities where the incidence of goiter is small and mild in type, it should be under the supervision of private physicians, aided by proper public health education.

Other methods of combating simple goiter have been suggested, among which may be mentioned, in the order of their popularity: (1) The addition of sodium iodid to the community water supply, (2) iodized table salt, (3) tincture of iodin painted over the region of the thyroid gland, and (4) inhalation of tincture of iodin exposed in the classroom.

Palmer [31] has authorized the addition of sodium iodid to the waters of Hemlock Lake which supplies the drinking water to the town of Rochester, N. Y. Sloan [27] and Hirschfelder [28] are advocates of iodized table salt. Weith,[26] Luckhardt, Koch, Schroeder and Weiland [34] are strongly in favor of the use of the inhalation method. The external application of iodin has been entirely discarded by Crotti [35] who first suggested the method.

SUMMARY

1. Numerous investigators have found that a definite thyroid incidence exists among school children in certain localities of the United States, known as goiter belts.

2. Goitrous regions are identified as localities deficient in the iodin content of the water supply, salt and air.

3. Simple goiter is a disease of iodin starvation.

4. Simple goiter is evidenced by an enlargement of the thyroid gland.

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34. Luckhardt, A. B.; Koch, F. C.; Schroeder, and Weiland: Physiological Action of Iodin Fumes, J. Pharm. & Exper. Therap. **15**:1-21 (March) 1920.

35. Crotti, Andre: Thyroid and Thymus, Ed. 2., Philadelphia, Lea and Febiger, 1922, p. 307.

5. Simple goiters are more prevalent in girls than in boys.

6. The etiology of goiter is unknown, although it is known to develop when the iodin content of the thyroid gland falls below one tenth of 1 per cent. of the total dried substance of the gland.

7. Thyroid enlargements make their appearance at four periods of life: Fetal, adolescence, during pregnancy and at the menopause.

8. Simple goiter is a compensatory hyperplasia of the thyroid gland, developing during the course of certain metabolic disturbances of unknown origin, but immediately dependent on a relative or on an absolute deficiency of iodin.

9. Iodin exercises both a prophylactic and a curative effect on simple goiters.

10. The study disclosed that enlarged thyroids were most prevalent between the ages of 13 and 15 years.

11. The greatest incidence of thyroid enlargement was in the slightly enlarged group, 17.2 per cent.; moderately enlarged, 2.6 per cent.; markedly enlarged, 0.5 per cent.; total, 20.3 per cent.

12. Thyroid enlargement in colored children is approximately 7 per cent. less frequent than in the white children in this study. Some observers state that a racial immunity to endemic goiter exists.

13. Although the study suggests that the percentage of incidence of normal glands seems to vary inversely with the activity of the menstrual cycle, the findings should not be construed as conclusive.

14. A distinct relationship exists between thyroid incidence and such signs as tremor, mottling and exophthalmos.

15. Girls whose mothers were of foreign birth showed the least incidence to thyroid enlargement.

RECOMMENDATIONS

A notation of the condition of the thyroid gland should be included in the routine examination of all school children by the family physician and by the school medical inspector.

Particular care should be taken to note whether or not the thyroid gland is enlarged in girls, as well as in boys, on graduation from the elementary schools, at the time of securing working papers, and especially throughout the child's high school career. The observations should be extended also to young men and women attending the training schools, normal schools and colleges. Periodic health examinations are advocated also for individuals outside the domain of schools and colleges, that they may be observed for preclinical signs of goiter.

Physicians should realize that a tendency toward thyroid enlargement exists among children and young adults, particularly before and during the pubescent period. The presence of an enlarged thyroid gland should

be considered an abnormal condition at this time of life, and all persons with simple goiter should have the benefit of iodin medication under the direct supervision of a physician. In particular, pediatricians and obstetricians should employ iodin more frequently in a routine manner, in an effort to reduce the incidence of simple goiter. The laity should be educated to seek periodic health examinations, to the end that they may be safeguarded against preventable diseases, of which simple goiter is one. Public health information and publicity of this nature should be given by physicians in the course of their private and public health practice, through health departments, boards of education, academies of medicine, county medical societies, public health agencies and Medical Colleges.

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CONGENITAL WEBBING *

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Klippel and Feil,[1] in 1913, described a case of complete absence of cervical vertebrae, and expressed the opinion that the examination of persons with short necks might often reveal the absence of one or more cervical vertebrae. Since then, many cases of Klippel-Feil's disease, or "congenital short neck," have been reported. The clinical picture is characteristic and easily recognizable. The cervical spine is obviously very short, the lower border of the hair low, the chin receding, the back of the head and neck flat and the movements of the head usually greatly limited. A webbing of the skin of the neck is sometimes present and may be found without any decrease in the length of the neck.

The webbing was first described by Kobylinski[2] in 1882, but no relationship between this condition and congenital short neck was suggested until 1922, when Drachter,[3] describing a case of congenital short neck, said that sometimes these patients have webbing of the skin of the neck. He considers that the webbing is an added feature of Klippel-Feil's syndrome. This is the most uncommon feature of congenital short neck, the most usual being the absence or fusing of the cervical vertebrae. No instance can be found in the literature of more than one member of a family showing the anomaly.

REPORT OF CASES

CASES 1 and 2.—In August, 1924, two sisters, aged 12 and 6 years, respectively, came to the Clinic presenting this very noticeable deformity. From birth there had been a fold of the skin running from mastoid to acromion on each side. Otherwise there was no complaint, the children being active and healthy. Two other children were normal. It was at once apparent that there was a marked retardation in growth. The elder child showed no signs of the approach of puberty. The mobility of the head was so limited that in looking around, the shoulders as well as the head were turned. The ears were relatively large. There was marked hairiness of the back of the neck, well down toward the shoulders, and an abnormal fold of skin from the tip of the mastoid to the acromion on each side, which was soft and movable and consisted of skin and fascia only. Figures 1 to 4 show the head sunken between shrugging shoulders, as if drawn down by the lateral bands. The

* Received for publication, Feb. 28, 1925.

1. Klippel, M., and Feil, Andre: Un cas d'absence des vertèbres cervicales avec cage thoracique remontant jusqu' à la base du crane (cage thoracique cervicle), Nouv. iconog. de la Salpètrière **25**:223-250, 1912.

2. Kobylinski, O.: Ueber eine flughautähnliche Ausbreitung am Halse, Arch. f. Anthrop. **14**:343-348, 1883.

3. Drachter, R.: Demonstration, Klin. Wchnschr. **1**:664, 1923.

nipples were low and flat. In the younger girl there was marked webbing of the axillary folds so that the arms could not be raised above the head. Roentgen-ray examination was not satisfactory because of the short neck which made it difficult to count the cervical vertebrae, two of which seemed to be missing. Rudimentary cervical ribs were present in the elder child.

CASE 3.—A woman, aged 28, was examined at the Mayo Clinic in 1922. There were congenital raised folds of the skin on both sides of the neck, and the hair margin was low on the back of the neck. There was nothing of note in the family history. Roentgen-ray examination of the cervical spine showed rudimentary cervical ribs but was otherwise negative. The neck seemed of normal length (Fig. 5).

Fig. 1.—Webbing of the neck (anterior view).

CASE 4.—A girl, aged 7, an only child, was brought to the Clinic because she had had difficulty in walking. The history of birth and development was negative. On examination, it was noticed that there were folds of skin on both sides of the neck and webbing of the axillae.

WEBBING OF THE NECK IN THE LITERATURE

Three cases of webbing of the neck are reviewed from the literature. The first is that Kobylinski. The patient, seen at Vogel's Clinic in Dorpat, was a Jewish youth, aged 20, having "wing-like folds of skin on the neck." He had pulmonary tuberculosis. The movements of the head were free in all directions. Kobylinski thought at first that the

short trapezius was the cause of the deformity. Electrical reaction, however, showed that the web contained no muscle. He considered that the bones and muscles were entirely normal except perhaps the musculus splenius capitis et colli. The eyebrows and hair were connected. The forehead was short and the hair margin low. He could find no similar case in the literature. In the picture of a chimpanzee he thought he saw similar webbing and speculatively assigned atavism as the cause.

Fig. 2—Webbing of the neck (posterior view).

Funke [4] reported a similar case in 1902, under the title of "Pterygium colli." The patient was a girl, aged 15, who had had an abnormality of the neck since birth. She was retarded in growth, weighing 78 pounds (35 kg.) and measuring 135 cm. when seen. The ears were relatively large. On either side of the neck there was a soft, movable fold from the mastoid to the acromion. There was marked hairiness, the hair extending well down below the mastoid process. The chin was of a

4. Funke: Pterygium Colli, Deutsch. Ztschr. f. Chir. **63**:162-167, 1902.

peculiar receding type. The head moved normally in spite of the skin folds. There was entire absence of breasts, the nipples were not developed, and there was a total lack of hair in the axillae and on the mons veneris. Menstruation had not commenced at the age of 15 years and 9 months. The internal organs were normal. The speech was nasal and the palate high. Funke considered that his case showed complete agreement with Kobylinski's. However, the supraclavicular fossae

Fig. 3.—Webbing of the neck and axillae.

were not prominent in Funke's case, as they were in Kobylinski's, because the patient was well nourished.

At operation Funke saw that the sternomastoid was present in the upper half of the fold and some fibers of the trapezius in the lower and posterior part. He removed the fold and was able to spread it out on the table smoothly. Below the fascia of the fold lay the musculus splenius capitis.

In order to explain this anomalous condition, Funke considered that we must not only look at the fold of the skin but also at the other changes of the head. He thought that there was no excess of skin on the neck, but that it appeared as if the skin had been grasped laterally with both hands, lifted up in the form of a fold and so held during embryonal and later growth. A permanent pressure is thus exerted on the external ear and the lateral parts of the bony skull. The auricle,

Fig. 4.—Webbing of the neck.

especially its upper part, is drawn downward and backward. The drum cannot be seen because the canal is distorted. The palate has a high arch. The mouth is pulled backward and downward and is not in a horizontal position. This all takes place because of amniotic adhesions, the formation of which is favored by the fact that the inner surface of the amnion and the surface of the embryo are covered by ectoderm. Whether such adhesions, secondary fold formation and traction, are due to inflammation is undecided.

Bussière [5] described a case seen in July, 1900, at Pondichéry, in a Hindu, aged 12, whom he called "L'homme au cou de capelle." There was no monstrosity or developmental defect in parents, brothers or sisters. During gestation his mother had been frightened by a cobra. The cobra or hooded serpent of India is considered sacred, and when the child was born with lateral expansions on each side of the neck, the influence of the serpent was seen. The child was regarded with

Fig. 5.—Webbing of the neck.

curiosity and veneration and as he grew up was called the cobra man. Seen from the side, the neck presented practically nothing abnormal. Seen from the front, there were bands from the mastoid toward the acromioclavicular angle where they faded imperceptibly. The right was the more noticeable. The skin of the fold slid loosely on the

5. Bussière, J. A.: L'homme au cou de capelle, dévelopement anormal d'un faisceau musculaire acromio-mastoïdien rudimentaire, malformation congénitale rare, observée á Pondichéry (Indes Orientales), Ann. d'Hyg. et de Méd., Colon, **5**:686-688, 1902.

subcutaneous tissue. The movements of the head and arms were not hindered. The right ear was bent forward. The intelligence was normal. Growth was not interfered with and there were no other deformities. Religious compunctions prevented his family from accepting surgical aid, and the parents had seemingly never noticed the webbing of the neck and axillae, but had attributed the stiff neck, with inability to turn the head, to an attack of "flu" which he had had at the age of 3. He had never walked normally. When seen, he held the head forward, and the lower jaw was so short that the upper overrode. The palate was high and the uvula long. There was much developmental abnormality, especially in bones and joints, with epiphysitis, cystic bone disease and arthritis associated with a spasticity not typical of either spastic paraplegia or chronic lethargic encephalitis. It was debatable whether the impaired development was purely congenital, entirely acquired, or the progressive result of a congenital defect of the governing mechanism.

CONCLUSION

The occurrence of the condition in sisters throws doubt on the amniotic adhesion theory of Funke, as does also the fact that in two cases there was webbing of the skin at the armpits. Moreover, the skin fold in these patients was not united and showed no inflammatory change. When removed, as was done by Funke, the skin could be laid out flat on the table and showed no ridge. A more simple and logical explanation is that of "too little skin," as occurs in webbing at the axilla, the knee-joint or the fingers. The deficiency results in a straight line occurring between the mastoid and the acromion instead of the longer curved line; this leads to a shortening of the mandible and a flattening of the base of the skull during development. There was a decrease in the number, or a fusion of some of the cervical vertebrae in a few of the cases of the present series.

All of the patients in the series presented definite stigmas except the third of the three referred to in the literature. Two showed developmental defects and stigmas. In only two of the series was there a definite congenital short neck, but the general association of some of the defects, malformations and stigmas in all members of the series seems sufficient ground for grouping them together.

PROGRESS IN PEDIATRICS

RECENT WORK IN ANATOMY, PHYSIOLOGY AND PATHOLOGY OF INFANCY AND CHILDHOOD

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BALTIMORE

CHILD WELFARE

The trend of modern child welfare work is indicated by the resolutions adopted by the International Association for the Promotion of Child Welfare in its session at Geneva.[65]

1. *Regulation of Infant Rearing Centers.*—Because of the difficulty in supervising the care of infants placed out promiscuously, it was recommended that "rearing centers" be established, directed by qualified medical officers.

2. *Improvement of Crèches.*—(*a*) All day nurseries should be under the direction of a physician; (*b*) they should have separate rooms for the cradles, for the linen, for disinfecting purposes and for isolating patients; and (*c*) they should be open to the pupils of puericulture schools.

3. *School Hygiene.*—There should be close collaboration between the teacher, the school physician and the school nurse. The teacher should have a knowledge of the fundamental rules of hygiene. Each child should undergo a yearly examination, records should be kept and proper action should be taken as indicated by the examination. From a prophylactic point of view, the attention of the public authorities is called (*a*) to the importance of the medical examination from the standpoint of the teacher and (*b*) to the importance of dental hygiene and treatment.

In a declaration of rights of children,[66] called the Declaration of Geneva, it is declared that men and women of all nations should give to children the best gifts in their possession, and affirm their rights irrespective of race, nationality and religion.

1. Children should be placed in an environment in which they can develop normally, physically and mentally.

2. A child that is hungry should be fed; a child that is sick should be cared for; the backward child should be encouraged; the child that has gone astray should be reclaimed; the orphan and the deserted child should be given a home and their distress relieved.

3. Children should be the first to receive aid in time of distress.

4. A child must be put in a position to earn his living and should be protected against exploitation.

5. Children should be brought up to believe that their best qualities must be used in the service of their fellows.

Dr. Weill-Hallé,[67] secretary of the school of puericulture function-

65. International Promotion of Child Welfare, J. A. M. A. **81**:1533 (Nov. 3) 1923.

66. The Declaration of Rights of Children, J. A. M. A. **82**:1456 (May 3) 1924.

67. The School of Puericulture, J. A. M. A. **82**:1133 (April 5) 1924.

ing under the University of Paris, refers to the low mortality rate of 3 per cent. among 1,174 infants under its surveillance. The value of the social service of the school is emphasized, 18,844 domiciliary visits having been made during the year.

In Belgium,[68] a school of puericulture has been established under the direction of a committee of physicians, to give instruction in the hygienic care of young children to school teachers, supervisors of crèches, midwives, mothers and children and young women. The courses cover a period of two years, at the conclusion of which final examinations are held. After the second year, during which short periods are to be spent in children's hospitals, crèches and consultation services on infant care, a diploma as a "maternal assistant" is to be given, endorsed by the government.

Loir and Legangneux[69] point to the frequency of unhygienic postures in children, amounting almost to the rule rather than to the exception, and attribute it to the wearing of clothes, including underwear, until the garments have become too short for the body. Parents do not realize that clothes become too narrow, and thus check the normal development of the chest.

In Great Britain, Sir George Newman[70] considers the lack of adequate supervision of the infant during preschool life as the "most serious and wasteful defect in our national health service." The most urgent questions awaiting solution in many educational areas are: (1) the further coordination of the school medical work with the public health service; (2) the physical condition of children under 5 years of age; (3) the effective education of the dull or backward child; (4) the importance of a comprehensive scheme for the treatment of dental defects, and (5) the systematic organization of the teaching of hygiene and physical training.

During 1922, 46 per cent. of the school children were medically inspected. It is held that from 80 to 90 per cent. of the children are born healthy, and with the potentiality of leading healthy and normal lives. After the first year of life the child has to bear the burdens associated with bad housing, poverty, and absence of hygienic supervision. As the result, when admitted to school at 5 years of age, from 35 to 40 per cent. are found to bear physical defects which might have been either prevented or cured. The relative proportions found among these defects

68. School of Puericulture, J. A. M. A. **81**:1970 (Dec. 8) 1923.

69. Loir, A., and Legangneux: Suggestions from School Inspection, Bull. de l'Acad. de Méd. **91**:14 (Jan. 2) 1924.

70. The Health of Schoolchildren, J. A. M. A. **81**:1890 (Dec. 1) 1923.

are: A severe form of dental disease, 34 per cent.; defective vision, 30 per cent. (10 per cent. serious); ear, nose and throat disease, 14 per cent. Heart disease, definite malnutrition, anemia, and deformities are present each in about 2 per cent.

INSTITUTIONAL CARE

Some factors promoting the health of children are enumerated by Holt and Fales,[71] in a report on the growth and general condition of the boys and girls in a semicharitable home and school for poor children in New York City. Though these children lived under supposedly unideal conditions, being housed in the heart of the business section, cut off from a generous supply of light and fresh air for all but a few weeks of each year, and receiving a limited diet showing considerable deviations from accepted optimum standards, yet health and digestion remained excellent and gains in weight were satisfactory. The factors that contributed to the good result were adjudged to be: (1) regularity in habits of eating and in sleep, rest and exercise; (2) a liberal but simple diet, and (3) freedom from contact infections.

In this group of children, it was found that nationality had no apparent effect on the weight-height ratio of the children. Nor was any distinct seasonal variation in the rate of month gain in weight observable other than that the tendency was certainly toward a more rapid gain in the autumn months. It seems clear, says Dr. Holt, that it cannot be laid down as a rule that a healthy child gains a certain amount each month, nor that (as asserted by Gebhart) at any particular month or period the increase in weight is regularly more rapid, and at another period regularly slower than the average rate for the year (as was indicated by Porter's figures).

The seasonal variations in diet and environment among these children were considered insignificant, and the fact that the children showed markedly irregular variation in monthly gain would seem to indicate that the seasonal variation found by others is not due chiefly to the factors mentioned. The annual increment was quite uniform. (Changing from active vacation days to those less active, from four to five hours a day of school life, may be a factor.) This emphasizes the necessity of prolonged observations before a stationary weight can be considered significant.

That short children grew more slowly and tall children more rapidly than the average, so that, as a rule, short children became short adults and tall children tall adults, is cited as one of the observed factors in regard to growth.

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71. Holt, L. E., and Fales, H. L.: Observations on the Health and Growth of Children in An Institution, Am. J. Dis. Child. **26**:1 (July) 1923; editorial J. A. M. A. **81**:1117 (Sept. 20) 1923.

In this study it was found that the children who fell below the average height were predominately of the older age groups, and were, as individuals, often of races in which there is no tendency to shortness. Since also these older children had been longest under the influence of a diet deficient in calcium, the interesting question is raised whether it is possible to stimulate an established slow rate of growth by special diet. There is some experimental evidence that this can be done with animals under certain conditions. Holt concluded that growth possibly would have been better if more milk had been given, possibly more fat, more vitamin A and more calcium.

A table is given showing the menus in the institution for one week. Only a pint of milk was given until shortly before the observation was begun, than an addition to the diet of a pint of milk daily for each child had been made. As a whole, the caloric intake was high. The average distribution of the calories was: fat, 22 per cent.; carbohydrate, 61 per cent., and protein, 17 per cent., whereas the distribution figures considered ideal are: fat, 35 per cent.; carbohydrates, 50 per cent., and protein, 15 per cent. The proportion of protein from animal sources (56 per cent.) was considered somewhat lower than the optimum, but was compensated for by the generous total protein intake.

The usually accepted standard for normal nutrition, that is, inclusion in this group of those who were not more than 10 per cent. below the average weight for height, was found to hold good when applied to these children in spite of the differences of nationality (they were chiefly French, Spanish, Italian and Irish).

The impression is prevalent that children living in institutions decline in general health and vitality, and their growth and physical development are inhibited. Dr. Holt's observations on this group of children (144, aged from 4 to 16) show that this is not a necessary result, and that the contrary may be true.

(It is to be noted that this report deals with older children, aged from 4 to 16 years, and not with infants and very young children; also that the effects of institutional life on the mental development of the child are not considered.)

Katz and Gray [72] present the findings obtained in a month's observation of the inmates of a home for children in Boston. The children come from the poorest class, are all Jewish, nearly all orphans, native born, while their parents were practically all foreign born. The ages ranged from 5 to 17, mostly from 6 to 16 years; their stay in the insti-

72. Katz, S. E., and Gray, Horace: Health and Growth of Children in An Institution, Am. J. Dis. Child. **27**:464 (May) 1924.

tution is usually four years, one fourth of them having been there for five years. There were few cases of serious illness in the last year, and no epidemics of any sort for a number of years. The children go out to attend a neighboring public school. The good health of the children is thought "possibly the result of the regular life." The food is plentiful but very simple, meat seems somewhat lacking, soup, milk soup, eggs and fish being substitutes. The caloric intake was not determined, the general appearance of the children being held a sufficient index of the quality and quantity of the food consumed.

The children were of rather low stature, exhibiting a larger percentage below average in height than the children studied by Holt and Fales, a difference attributed by Katz and Gray to either their racial difference or their poorer economic status. The state of nutrition of children resident in the institution for seven years or more improved strikingly; the number of sick children, however, was small.

The children came from families averaging from four to six children, the commonest number being four; a point of interest because it shows that the families are smaller than is usually believed to be the case in this class. Further, the children were more frequently above normal in state of nutrition, a finding contrary to some statements in the literature. Moreover, the nutritional status of a child at the time of investigation did not suffer by an abundance of brothers and sisters.

The authors conclude that children of the poorest class, when under proper institutional care, catch up rapidly to normal children in physical respects. Whether they do so in the intellectual sphere will be dealt with in another paper.

That the circumstances that assist growth in children are more favorable in America than in England is the opinion of Dr. Milligan,[73] health officer for Reading. He makes comparison between the children examined during the last three years with American children of similar ages. The advantage rests with the American children in every case, and it increases in the older groups. The average height at 12 years, 3 months, is given as 54¼ inches (138.6 cm.) and the weight as 73 pounds (33 kg.), as against 56¼ inches (143.6 cm.) and 79 pounds (35 kg.) for American children.

In a study of 8,000 school children in Munich,[74] the children were found to be inferior to earlier generations, the reason assigned being war and postwar influences. They, too, were considerably below American children in height and weight.

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73. English Compared with American Children, J. A. M. A. **82**:1561 (May 10) 1924.

74. Height and Weight of School Children, J. A. M. A. **82**:1798 (May 31) 1924.

SOCIAL STATUS AND MORTALITY

The effect of social station as a factor in child mortality is considered by several writers. Lennox [75] reports on a group of 939 families, reporting 2,475 pregnancies, tabulating the results with reference to the medical and general education of the parents. The more highly educated parents report a higher proportion of living children who are in robust health. A disproportionate number of children whose parents had less than a grammar school education have died of infectious diseases.

College attendance of a parent or extended years of schooling is accompanied by slightly higher rates of mortality of children. In cases where two parents have attended colleges or had extended schooling there is a slightly lowered mortality rate. Families in which the father is a doctor do not have lower mortality rates among children than in the other professional or business groups. The small group of doctors engaged in a specialty show unusually high rates. Miscarriage rates for doctors' wives are high, probably because the reports from the occupational groups are falsely low.

That the more highly educated parents were able to report a larger proportion of their living children as in robust health does not in itself indicate that they contributed as many healthy children to the community. It may be assumed that they did not, owing to the lower birth rate that prevails in educated classes.

Schlesinger [76] states that, in Germany, the child mortality in larger families increases from 15 per cent. with four children, to 32 per cent. with seven, and over 50 per cent. with ten or more. The physical development is found to be substandard, especially from the third to the sixth year, and in the later children. After leaving school, 18 per cent. were incapable of self-support, but generally this righted itself later. Overcrowding in the home proves most injurious to the younger children.

Wilsing [77] reviews the results of child bearing in twenty-five girls between 13 and 16 years old. The labors were easy and the infants were of normal size and developed well physically. There was, however, frequent occurrence of mental disease among these children. This, the writer states, was probably due to hereditary predisposition, which was, he thinks, already manifest in the early sexual instinct of the mother.

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75. Lennox, W. G.: Child Mortality with Reference to the Higher Education of Parents, Am. J. Hygiene **4**:52 (Jan.) 1924.

76. Schlesinger, E.: Physical Status of Children in Large Families, Arch. f. Kinderh. **73**:50 (June 12) 1923.

77. Wilsing, A.: Children of Minor Mothers, Deutsch. med. Wchnschr. **49**: 125 (Aug. 22) 1923.

In examining 2,040 school children at Buenos Aires, Garrahan and Bettinotti [78] compared the findings with various methods of determining malnutrition in children. They concluded that the use of the Wood tables seems fully as instructive and reliable as any of the more complicated methods for detecting undernourishment.

Baldwin [79] emphasizes the many inaccuracies that enter into the reporting of heights and weights of school children. He finds it surprising how many measurements in our public schools are inaccurately recorded, how many are wrongly calculated, and how many dates of birth a child may have on record as reported by the father, mother, brother or sister, or the child. He holds that every school in America should have height measurements for the pupils twice each year, and the weight measurements at least every two or three months. Underweight children should be weighed monthly or bi-weekly. The procedure is to supplement, not to take the place of, the medical examination, though normal growth in weight and height is probably the best single index of good health and good nutrition during childhood.

New tables are presented which are based on data drawn from the records of 74,000 boys and 55,000 girls. The measurements were taken by trained examiners with standard methods, on nude children from eleven of the best schools in America. At least 95 per cent. of the children were American born. Only children who were presumably healthy and on whom from five to fourteen consecutive measurements, nearly all at yearly intervals, had been taken, were included.

Baldwin's study of several thousand individual growth curves, based on repeated measurements of the same children, shows him, as a rule, that tall children remain tall, and that short children remain short. He says that tall children also tend to mature earlier and to reach the final stature earlier than short children; they are usually accelerated physiologically.

Detailed instruction as to the mode of weighing and measuring, and of recording the age, is given.

Whether even these latest tables will prove satisfactory in practical application remains to be seen. In 1921, investigators [80] found that they were unable satisfactorily to evaluate results from successive programs of experiment in nutrition work because of the existing limitation of knowledge as to standards and laws of growth.

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78. Garrahan and Bettinotti: Determination of Malnutrition, Arch. Latino-Am. **18**:129 (March) 1924.

79. Baldwin, B. T.: The Use and Abuse of Weight-Height-Age Tables As Indexes of Health and Nutrition, J. A. M. A. **82**:1 (Jan. 5) 1924.

80. Hunt, J. L.; Johnson, B. J., and Lincoln, E. M.: Health Education and the Nutrition Class, New York, E. P. Dutton & Company, 1921.

SUBSTANDARD CHILDREN

Recently, a member of the U. S. Public Health Service [81] put some of the "standards" to a test in a group of more than 500 children who were examined, found free from defects and who were in apparently satisfactory physical condition. These standards of weight were applied to them. It was found that according to the Wood table (height-weight-age table), 20 per cent. of the children were more than 10 per cent. underweight; according to Dreyer's standard (stem-length and chest circumference) 13 per cent. of the children were more than 10 per cent. underweight, and according to Pirquet's pelidisi method, 17 per cent. had a rating of 94 or less and according to this standard were underweight.

Thus, out of 506 children, about 200 were classed as underweight by one or more of the three standards, and all the standards agreed on fifteen out of the 200 as being underweight. Yet they were children selected as specimens of health.

Clearly, such standards must not be applied too rigorously. Often they should be regarded as ideals toward which individuals may be encouraged to work, and bring out any latent family or racial capacity for improvement in age and in weight.

Van der Loo [82] accepts seven classes of substandard children: the undernourished and the overfed, those with narrow chests, anemia, extrarenal albuminuria, chronic enlargement of lymph glands, nervous and mixed forms. They are to be recognized by departure from the weight and chest measures that correspond to the height in the table of normal standards.

With a narrow chest, special exercises are necessary, but as the vital capacity is low, these children should rest a great deal and overexertion should be guarded against; for the excessively nervous a change of environment is advised, and for those with chronically enlarged lymph glands treatment as for tuberculosis.

A comparison of growth variation in underweight children, as influenced by different types of supplementary lunches, has been made by Chaney.[83] So far as could be determined by physical and dental exami-

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81. Clark, T.; Sydenstricker, E., and Collins, S. D.: Indices of Nutrition, Pub. Health Rep. **38**:1239 (June 8) 1923; editorial, J. A. M. A. **81**:1286 (Oct. 13) 1923.

82. Van der Loo, C. J.: Substandard Children, Nederlandsch Tijdsch. v. Geneesk. **1**:2519 (June 9) 1923.

83. Chaney, Margaret S.: A Comparison of the Value of Milk and Oranges as Supplementary Lunch for Underweight Children, Am. J. Dis. Child. **26**:237 (Oct.) 1923.

nation, the children were free to gain. The economic status of the majority of the homes permitted provision of adequate food.

It was found that oranges, fed to the children in this investigation—one medium sized orange and two large graham crackers as a mid-morning lunch—seemed most efficacious in producing gain in weight. This may be due to the vitamin content of the orange. Milk produced a less marked gain in weight, which may be due to lack of antiscorbutic vitamin and to its retarding effect on the appetite. Not all milk is of equal food value in vitamin and calcium content. Daniels and Stuessy (1916) are cited as having demonstrated that rats fed on milk boiled for one minute failed to gain normally unless the calcium deposit, produced by boiling, was combined with the milk. The calcium content of milk is altered by heating. Pasteurization has a similar effect.

THE BLOOD

Rucker and Connell [84] found that the mean systolic pressure at birth is 55 mm. of mercury; the mean diastolic 40. The systolic blood pressure increases with the age of the infant more rapidly than does the diastolic pressure. In general, the blood pressure varies directly with the total length of the infant; it is not influenced by sex or color. Toxic conditions in the mother seems to influence the blood pressure in the child.

Reis and Chaloupka [85] studied the blood pressure in 100 infants, born after normal and pathologic labors. The readings were taken with a mercury manometer and a 6 cm. wide arm band.

During the first day of life the average blood pressure in fifty-five full-term infants born of normal spontaneous labors was 43 mm. of mercury, the minimum recorded being 32 and the maximum 58 mm. There was a gradual daily rise in the blood pressure, until on the tenth day the average blood pressure was 78 mm. of mercury. The observations were not continued further. The greatest rise was during the first three days, the reading being 59 mm. on the fourth day. As a general rule, the blood pressure was higher in heavy infants.

The sex of the infant, presence or absence of jaundice or fever, pulse rate and caput succedaneum appeared to have no effect on the blood pressure. Low blood pressures were noted in premature infants and in twins. Increased blood pressure was noted in forceps cases, and in all these cases appeared to be due directly to increased trauma to the fetal head. As the infant improved clinically the reading gradually approached normal.

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84. Rucker, M. P., and Connell, J. W.: Blood Pressure in New-Born, Am. J. Dis. Child. **27**:6 (Jan.) 1924.

85. Reis, R. A., and Chaloupka, A. J.: Surg., Gynec. & Obst. **37**:206, 1923.

Fabris [86] made similar observations on a smaller number of cases—twenty-eight male infants and twenty-two female infants, aged from 4 hours to 9 days—and found that the blood pressure varied from 40 to 60 mm. systolic and 20 to 40 mm. of mercury diastolic. The blood pressure was in direct relation to the body weight, and consequently lowest in premature infants. It increased with age; sex, and as a rule the mode of feeding, had no influence on it.

BLOOD VOLUME

A micromodification of the dye method of Keith, Rowntree and Geraghty, by which the volume of blood in the body can be determined by withdrawing 4 c.c., is described by Bakwin and Rivkin.[87] No study on fluid regulation in the body can be complete without some knowledge of the total amount of circulating fluid, they observe, and, because of the large amounts of blood hitherto necessary to estimate blood volume, few determinations have been made on infants.

The method of Keith, Rowntree and Geraghty (1915) was modified by Hooper, Smith, Belt and Whipple (1920), and Lucas and Dearing (1921) found that in normal infants the values were higher and varied more widely than in adults, the new-born having a blood volume of 10.7 to 19.5 per cent. of the body weight, averaging 14.7. Marriott and Perkins (1920-1921) found lower figures in infants who were suffering from marasmus, and concluded that the volume of blood in infants with marasmus is lower than that in normal infants, the figures ranging downward to 4.0 per cent. of the body weight.

Bakwin and Rivkin, using brilliant vital red in physiologic sodium chlorid solution, concluded likewise that the volume of blood and plasma in infants is higher in relation to the body weight and varies more widely than in adults, and that it is higher yet in marantic infants.

The average value for the blood volume is given as 101 c.c. per kilogram of body weight, and for the plasma 61 c.c. per kilogram. The volume of blood per unit of body surface in infants is much smaller than in adults (1.7 liters per square meter for infants, 3.12 liters for adults). Graphs are given showing the decline in volume of blood and of red cells with increasing age in months. The absolute volume of red cells is less at 8 weeks of age than at birth.

Interesting observations on the effect of giving fluid by mouth, rather than hypodermically or intraperitoneally, for the reduction of temper-

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86. Fabris, S.: Pediatria **31**:198 (Feb. 15) 1923.

87. Bakwin, Harry, and Rivkin, Helen: The Estimation of the Volume of Blood in Normal Infants and in Infants with Severe Malnutrition, Am. J. Dis. Child. **27**:340 (April) 1924.

ature in dehydration fever in the new-born and in older infants (dehydration as a result of severe diarrhea) are reported by Bakwin in another paper.[88]

When fluid was given by mouth (gavage) in the proportion of from 30 to 40 c.c. per kilogram of body weight, a prompt fall in the temperature and blood concentration followed with great regularity. The temperature usually reached normal within from 30 to 90 minutes. When the fluid was given hypodermically (saline) or intraperitoneally, the effect on the temperature and on the blood concentration was neither so marked nor so regular as after water by mouth. In a graph of older infants, dehydrated as a result of severe diarrhea, fluid by mouth (water or 5 per cent. glucose solution slowly diffused through a nasal tube) was much more effective in reducing the concentration of the blood than fluid given by hypodermoclysis or by intraperitoneal injection.

It is stated that water by mouth, in amounts similar to those used in the new-born with fever, has practically no effect on the temperature of infants with fever due to various infections.

A definite and constant difference between the combining power of the plasma of the mother and the infant is found by Williamson.[89] This difference may be due to a physiologic lag at the placental barrier, partial asphyxia, or an inadequate infantile mechanism for preserving the equilibrium. He presents graphs to show a definite and characteristic drop in the plasma combining power in the mother as gestation goes on to completion and labor. The low point, which most patients reached and yet recovered, demonstrates the effectiveness of the mechanisms that protect the individual; yet the findings suggest acidosis as a cause for some sudden deaths in cesarean section and in other types of delivery in which death occurs apparently from shock.

Aldrich and McClure[90] find that the rapidity of the absorption of 0.2 c.c. of physiologic sodium chlorid solution, injected intradermally in children over 1 year of age, varies from normal with the approach or subsidence of edema, and may be used as a means of ascertaining a return to normal. The observations tend to confirm the theory that the tissues take an active part in the production of edema.

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88. Bakwin, H.; Morris, R. M., and Southworth, J. D.: The Effect of Fluid on the Temperature and Blood Concentration in the New-Born with Fever, Am. J. Dis. Child. **27**:578 (June) 1924.

89. Williamson, A. C.: Acid Base Equilibrium in Pregnancy and New-Born, Am. J. Obst. & Gynec. **6**:263 (Sept.) 1923.

90. Aldrich, C. A., and McClure, W. B.: The Intradermal Salt Solution Test. II. Its Prognostic Value in "Nephritis" with Generalized Edema, J. A. M. A. **82**:1425 (May 3) 1924.

Nassau and Hendelsohn [91] found that the serum of infants suffering from severe nutritional disturbances was flocculated by a lower concentration of alcohol than the controls, and think that clinical inference may be drawn from the test as to further feeding.

Biasi,[92] in studying the iso-agglutinins in the blood of the new-born, concludes that he has demonstrated practically that mothers may be used with impunity in transfusing their new-born infant without any danger whatsoever. Proof is given that the corpuscles of new-born infants have their quota of receptors, as shown by the fact that in all of the 100 cases the new-born babies were grouped successfully according to the Moss classification.

Gallo [93] found the average figures (from 0.034 to 0.055 per cent.) for iron in the blood of the new-born lower than in adults. There was no direct proportion between the amount of hemoglobin and of iron.

Lippman [94] reports the results of a comprehensive study on the constituents of the blood of new-born infants, and the changes occurring in it during the first few days of life. The paper is replete with detail.

Seventy-one new-born infants (thirty-one girls and forty boys) were used in the study. Much care was taken to exclude all abnormal babies, instances of cutaneous infection and the like. Icterus neonatorum was not a cause for exclusion.

Examinations of the blood were made as soon after birth as possible, and then at approximately six-hour intervals up to and including thirty-six hours, then at fifty-eight hours, and a final one at 5 days of age. Counts were made of the red blood cells, leukocytes and platelets. Five hundred cells were included in each differential count, and the complete individual differential counts have been placed on file at the Wistar Institute of Anatomy, Philadelphia. No difference in the blood findings as between the sexes was noted. In five cases of marked icterus neonatorum no changes from the normal were noted in the total cell counts or in the differential counts.

Evidence is given to show that the changes found could not be attributed to dehydration of the new-born. The material included some infants in whom the weight loss was small, and any concentration apparently very small, yet these conformed to the usual finding.

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91. Nassau and Hendelsohn: Colloidal Stability of the Serum, Klin. Wchnschr. **2**:1835 (Oct.) 1923.

92. Biasi, Bruno de: Studies on Iso-Agglutinins in the Blood of the New-Born, J. A. M. A. **81**:1776 (Nov. 24) 1924.

93. Gallo, C.: Iron in Blood of the New-Born, Pediatria **32**:606 (May 15) 1924.

94. Lippman, H. S.: A Morphologic and Qualitative Study of the Red Blood Corpuscles in the New-Born Period, Am. J. Dis. Child. **27**:473 (May) 1924.

The morphology of the blood of the new-born was found to differ in many respects from that of the adult.

The blood cells at birth average 5.2 million per cubic millimeter. During the first six hours the count rises to 5.6 million. Following this, there is a drop to 5.4 million at eighteen hours, after which time the count remains fairly constant until forty-eight hours after birth. An analysis of the material is held to show definitely that the amount of weight loss in the first two days bears no relationship to the red cell count. Study of the differential counts emphasizes the fact that the variations noted in the new-born period are due to increased activity of the hemopoietic organs.

The platelet counts at birth average 213,000 per cubic millimeter. It drops to 170,000 during the first six hours. The decrease continues until eighteen hours after birth and is then followed by a slight increase. The platelets are larger in the blood of the new-born than in that of the adult, and their variations in size are greater than that ordinarily seen in the adult. No changes from normal were observed in the platelet counts in icterus neonatorum.

The total leukocyte count at birth averages 16,600 per cubic millimeter. At twelve hours it is 22,500, after which it gradually drops to 11,300 at forty-eight hours. At five days it has decreased to 9,500. It is mentioned that other observers have found that after the five day period the white count remains about from 7,000 to 10,000; yet one often reads that from 12,000 to 15,000 are normal values for infants and children.

The differential counts show wide variations. The relative and absolute values of the lymphocytes and neutrophils are equal at forty-eight hours; after this, the value for the former increases at the expense of the latter. The absolute values of the lymphocytes vary little during the first five days. The mononuclears and transitionals are present in the same percentages as later in life. The eosinophils gradually rise in number until thirty hours after birth and then become less numerous. Basophils are rare.

Every case showed nucleated red blood cells. At forty-eight hours only half the cases showed them, and at five days only one case. Taken as a whole, the red cell picture resembles that of secondary anemia following hemorrhage, where one sees anisocytosis, polychromatophylic and nucleated red cells. However, in the picture of the new-born blood there is nothing present to suggest anything but a physiologic process.

In his conclusions, Lippman assembles much evidence for the belief that the changes observed in the red blood cell, platelet and leukocyte count are due to increased activity of the hemopoietic organs. Elsewhere he considers causes for such increased activity.

Emanuele [95] reports that the number of blood platelets decreases in the first days of extra-uterine life. Coagulation time becomes longer with the decrease of platelets. Premature infants have more platelets.

C. and S. Frankenstein [96] report on the differential cell count of premature infants. They think the differential cell count of great value in the diagnosis and prognosis of disease in infants, more particularly with acute infections, and intestinal disturbances and atrophy.

SECONDARY ANEMIA

Lucas and Hoobler,[97] presenting a study on acute secondary anemias of childhood, declare that new facts concerning blood destruction and blood degeneration are constantly necessitating a revision of our conceptions of these conditions. It is estimated that normally one-tenth to one-thirteenth of the total blood is destroyed each day; its replacement is the result of continuous activity on the part of a widely distributed hematopoietic system. Undoubtedly, there is a very delicately balanced coordination between these two processes.

The methods of normal blood destruction are phagocytosis and fragmentation, and under abnormal conditions destruction may be brought about by the added factor of hemolysis. The bone marrow normally produces just a sufficient number of red blood cells to replace those destroyed, and the two phenomena, represented by mitochondria and reticulum, are held to be most reliable in estimating the amount of regeneration from day to day. The platelet count also yields valuable information, as it is definitely diminished when the marrow regeneration is defective. Reduction below a certain number (approximately 50,000 to the cubic millimeter) is held to indicate that the marrow is nearing a dangerous functional margin.

Comparatively little is known regarding the regeneration or degeneration of the white cells, and intensive study of their vital staining reaction and of the condition of pseudopodia movement is needed. The authors tabulate the accepted and the suggestive evidences of regeneration and degeneration of the blood cells, and find that they can place the acute anemias of childhood which they have studied in four groups, according

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95. Emanuele, A.: Blood Platelets and Coagulability in New-Born, Pediatria **31**:422 (April 15) 1923.

96. Frankenstein, C., and Stecher, L.: The Value of the Hemogram in Infancy, Ztschr. f. Kinderh. **37**:145, 1924.

97. Lucas, W. P., and Hoobler, H. R.: Study of Acute Secondary Anemias in Infancy, Am. J. Dis. Child. **26**:291 (Oct.) 1923.

to the method of their production: (1) mechanical loss of blood; (2) hemoglobin deficiency; (3) destruction of bone marrow; (4) bone marrow and blood stream complex.

In the first group the predominating picture is that of regeneration, evidence of which may be seen as early as fifteen minutes after the hemorrhage. Experimentally, the return to normal is very rapid, provided the hemorrhages are not repeated too often and the amount of blood lost is not more than 50 per cent. of the total blood volume (Whipple). There is marked stimulation of the bone marrow and rapid regeneration if the proper dietary factors are supplied. Repeated bleedings combined with inadequate diet cause a blood picture of diminished hemoglobin and reduced red cell count, with little or no other change. Stimulation of the bone marrow has now become difficult; it may not respond to dietary and hygienic measures, and the more radical stimulation of transfusion may be necessary.

The second group is most commonly found in premature infants, in twins, in infants born of anemic mothers or of mothers who have had some acute infection during the last few months of pregnancy. It is attributed to a definite lack of iron deposited during fetal life. It is found also in infants who have had a diet definitely inadequate in iron over a long period, being met with most commonly in infants between 10 and 18 months of age. There is marked and disproportionate reduction in the hemoglobin; evidences of regeneration of the red cells are slight, and there is little or no evidence of degenerative processes going on; the white blood series show an essentially normal picture. The anemia is one of the most persistent, and often it is difficult to alter the blood picture. Proper dietary measures and the administration of iron are recommended; where the hemoglobin is below 30 per cent. the authors have obtained the best results from repeated small transfusions, at short intervals, with resulting striking improvement in the appetite and general well-being of the child. Bone marrow punctures show a bone marrow that appears to be fairly normal except that it is regenerating more slowly.

The third group, with destruction of bone marrow, is the most difficult of interpretation. In its extreme form there is a picture of almost complete aplasia of the bone marrow. The characteristic blood picture of this group is a hemoglobin percentage often below 20 and rarely above 30, and a relatively lowered count. Shadow forms and fragmentation of the red cells may be quite marked, but there is little poikilocytosis and only a slight tendency to anisocytosis or polychromasia. The percentage of reticulum and mitochondria is so low that one might say both are absent. One of the most prominent features of this type of anemia is the marked reduction in the number of platelets and in the

granular series of the leukocytes. The platelets are often diminished to below 50,000 per cubic millimeter, but may not be so. The tendency to hemorrhage associated with a reduced platelet count is often one of the most alarming and grave symptoms of this type of anemia. On the one hand, the authors have seen patients with identical blood pictures improve and recover, and, on the other, progress steadily to the fatal termination of a true aplastic anemia. In their opinion, the toxic results of infection play a most important part in the production of both types of conditions. Just as a complete or partial aplasia may be experimentally produced by benzine, roentgen ray or radium, so various types of infections may produce the same results. Here again they have had the best results from repeated small transfusions.

In the fourth group a complex picture of blood destruction is presented, occurring partly in the blood stream and in part involving the bone marrow. The blood picture usually shows definite signs of degeneration and regeneration. Signs of toxic effect on the cells in the circulation is shown by the marked achromasia and numbers of shadow forms with fine granules around the periphery. The white count may be high. White cells also show evidence of toxic effect in the circulation. The most prominent feature of the blood picture is the increased destruction of the white cells, both young and old. This is the form of acute anemia often found in acute pyogenic infections, and during such an infection, the authors followed the blood and bone marrow conditions from a stage of marked hyperplasia to one of complete aplasia, a single case presenting the complex picture which this group is capable of exhibiting. In this group, transfusions are of more value if given at a time when signs of destruction or beginning hypoplasia or defective functioning of the bone marrow are evident. The authors give small amounts, from 30 to 60 c.c., and at short intervals.

Lucas and Hoobler feel that their studies help to give a better understanding of bone marrow activity, and assist in the clearer estimation of the progress of these acute anemias. The article is accompanied by a colored plate showing the blood picture in cases from Groups 2 and 3.

Donnally [98] reports a case of severe anemia in an otherwise healthy new-born infant. The anemia was so severe at 12 days of age that the patient seemed to be in danger of death from it. Examination of the blood showed various evidences of bone marrow activity and new blood formation, and no evidence of blood destruction. The white cells numbered 29,000, and pathologic lymphoid forms were present. There

98. Donnally, H. H.: Anemia in the New-Born, Am. J. Dis. Child. **27**:369 (April) 1924.

was absence of jaundice, and a striking and unexpected feature of the case was a normal color index of 1 that persisted while the anemia was disappearing.

All of the discoverable causes of such an anemia seemed to be excluded; on the part of the mother, acute illness during pregnancy, debility, hemolytic drugs and transmissible disease; on the part of the infant, prematurity and debility, infectious diseases, hemorrhages, and jaundice both hemolytic and icterus gravis. The patient's recovery was complete, and the subsequent development during three and a half years has been normal.

It is noted that anemia of the new-born is a rare occurrence. Premature and other infants destined to become anemic almost always manifest the red blood count and hemoglobin of the normal, healthy new-born at birth. The anemia appears first after the lapse of weeks or months. Ecklin [99] reported a marked but less severe anemia in a new-born infant, a comparison of which with the case reported by Donnally shows many points of resemblance, but prolonged search of the literature fails to reveal another.

Baer [100] gives a detailed description of three fatal cases of acute aleukocytemic leukemia in patients aged from 7 months to 7 years. In the presence of a hemoglobin of from 14 to 22 per cent., a color index of 1 + and a white count of from 2,000 to 6,000, the cases were considered leukemic on account of the predominance of leukocytes and lymphocyte-like cells (87 per cent.). Two of the cases were of the myeloid type and are a mixed myeloid and lymphatic. The etiology is unknown. Acute leukemia is considered by Baer to be much more common in children than in aplastic anemia.

A case of acute lymphatic leukemia, in a boy, aged 3 years, is reported by Benson and Carey.[101] The authors emphasize the exceeding rarity of myelogenous leukemia at this age. Numerous brief records of cases of leukemia in childhood are to be found in the clinical reports of the British medical societies.

Sickle cell anemia was first reported by Herrick in 1910. Since that time, three instances of this condition—a severe anemia characterized by the occurrence of elongated and sickle-shaped erythrocytes—have been described and another case mentioned. Sydenstricker, Mulherin and

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99. Ecklin, T.: Ein Fall im Amämie bei Neugebornen, Monatschr. f. Kinderh. **15**:425, 1919.

100. Baer, H.: Acute Aleucocytemic Leukemia in Childhood, Jahrb. f. Kinderh. **104**:1, 1924.

101. Benson, A. W., and Carey, H. C.: Acute Lymphatic Leukemia, Arch. Pediat. **40**:563 (Aug.) 1923; Brit. J. Dis. Child. **20**, 1923; ibid., **21**, 1924.

Houseal [102] report two cases of sickle cell anemia in colored children, with necropsy in one case. Dresbach and Bishop have called attention to the occurrence of elliptic cells in human blood in patients with no other evidence of abnormality, but the blood picture in their cases is thought to be quite different from that in the first case mentioned.

The writers feel warranted in stating that sickle cell anemia is a definite clinical entity, characterized by a definite symptom complex, by specific blood findings and by anatomic changes, and that it is a familial disease. There is strong evidence that it occurs only in the negro race or in persons of mixed blood.

The two cases reported were in full blooded negro boys, aged about 6 years. Both had attacks of high abdominal pain, localized in the epigastrium and left hypochondrium. The finding in the spleen in the first case showed that there had been repeated hemorrhages into the spleen. The peculiar scleral discoloration was present but not a frank jaundice. Both patients showed heavy urobilinuria and a bright yellow serum suggesting urobilinemia. There was evidence of a hemolytic factor in the production of the anemia, and phagocytosis of erythrocytes in the circulating blood was noted.

The blood examination in the patient that later came to necropsy showed red blood cells, 1,328,000; hemoglobin (Dare), 25 per cent.; leukocytes, 64,000, and color index, 0.9 per cent. Neutrophils formed 78.1 per cent. of the differential count, small mononuclears, 13.5 per cent., and eosinophils 0.9 per cent. The blood platelets were normal. (The absolute number of eosinophils was much increased.)

While making the red count, it was noted that a number of the erythrocytes in the counting chamber were tenuous. The impression was confined by examination of the stained smear, in which there were about 20 per cent. of sickle shaped and elongated red blood cells, varying greatly in size. The other red cells presented the appearances found in severe secondary anemia.

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102. Sydenstricker, V. P.; Mulherin, W. A., and Houseal, R. W.: Sickle Cell Anemia, Am. J. Dis. Child. **26**:133 (Aug.) 1923.

(To be continued)

Abstracts from Current Literature

Anatomy and Physiology

ANENCEPHALIC MONSTER. L. H. BLANCHARD, J. A. M. A. **84**:1041 (April 4) 1925.

A case of anencephaly with ectrodactylia of the upper extremities and phocomelia of the lower extremities was observed.

BONAR, Salt Lake City.

A PURE STRAIN OF THYROID CELLS AND ITS CHARACTERISTICS. ALBERT H. EBELING, J. Exper. Med. **41**:337, 1925.

The author succeeded in cultivating pure strains of thyroid epithelial cells obtained from the thyroid gland of 18 to 19 day old chick embryos. One strain was maintained in an active condition for seven months, when the experiment was discontinued, with the rate of cell multiplication still undiminished and with the cells still retaining their individual characteristics. When cultivated in D-5 flasks, the cells grew as a continuous membrane on the surface of the coagulum (mediums) and as glandular structures within the substance of coagulum. After 129 days of life in vitro, microscopic sections of such a glandular structure showed an aggregation of thyroid cells disposed in such a way as to form about from 40 to 50 acini with many of the acini nearly completely filled with colloid substance. The cell aggregates formed a cluster which resembled the cross section of a fresh thyroid gland of an 18 to 19 day old chick embryo.

The author states that the study of the endocrine glands by the method of tissue culture is shown to be practicable, and in the case of the thyroid, at least, can be used for the study of the function of the gland.

MCCLURE, Evanston, Ill.

A MICRO-FOLIN-WU METHOD OF QUANTITATIVE BLOOD SUGAR ESTIMATION, USING 0.1 C.C. OF BLOOD. T. L. BYRD, Wisconsin M. J. **23**:492 (Feb.) 1925.

It is obvious that a simple and accurate micromethod of quantitative blood sugar estimation is needed; one which requires a minimum amount of blood, that can be obtained from finger or ear prick thus eliminating the fear, pain and danger of a venipuncture. Such a method is especially applicable to infants and small children. The author details his micromethod and points out that it is a minimized and not a modified Folin-Wu method of blood sugar estimation. A blood diluting pipet of special construction is used, which solves the problem of obtaining accurately small amounts of blood and provides a simple means whereby physicians can obtain, measure and dilute specimens of blood and transport them to a laboratory. The simplicity and accuracy of the method make it desirable for routine use in institutions, clinic or private laboratory.

KASTNER, Milwaukee.

BILIRUBINEMIA IN CHILDHOOD. M. GIUFFRE, Pediatria **32**:1206, 1925.

Giuffre found that normal children, aged from 2 to 14 years, showed an absence of bilirubin in the blood. In infectious diseases such as measles, typhoid fever, tuberculosis, scarlet fever and kala-azar, bilirubin was found in the

blood; also for a short time following vaccination against smallpox. Giuffre states that Haselhorst's method is the easiest and most practical to determine the presence of bilirubin in the blood.

DE SANCTIS, New York.

MEASUREMENT OF MUSCLE HARDNESS IN CHILDREN. PART 1. METHOD AND NORMAL VALUES. HANS OPITZ and HEIMER ISBERT, Jahrb. f. Kinderh. **108**:1, 1925.

Palpation of muscles gives results which are subject to a great deal of variation in interpretation. A 5 gm. weight was applied to a superficial muscle such as the biceps brachii, using a lever arm, the weight being transmitted to the muscle by a surface 3 mm. in diameter. The amount of indentation caused by this weight could then be measured by a point on the opposite lever arm. Errors due to position of the patient and contraction of the muscle were eliminated so far as possible, so that the results are remarkably uniform. Results on the same individual on several different days were averaged.

From 1 year to 15 years, the hardness of the muscle gradually increases. Muscle hardness is independent of the absolute volume of the muscle. It is difficult or impossible to get reliable results on fat children.

HORMONES AND VITAMINS. PART 1. THE METHOD OF ACTION OF THE THYMUS GLAND ON GROWTH. KURT SCHEER, Jahrb. f. Kinderh. **108**:79, 1925.

Animal experiments have shown that the thymus gland is of importance in growth, namely, tadpoles when given thymus increase enormously in size but with delayed metamorphosis. In marasmus there is in atrophy of the thymus. Facts of this sort led to the investigation of the effect of thymus gland on the absorption of water by colloids.

Thymus gland substance was found definitely to increase the swelling of growing muscle or a colloid such as gelatin in a medium of serum or a physiologic salt solution. The optimum swelling occurs when the thymus is present in a concentration of from 0.2 to 0.02 per cent. This occurs without significant change in the hydrogen ion concentration.

Testis and thyroid have no such effect on absorption. This action of thymus on the absorption of water by colloids may explain its effect on growth.

SUTHERLAND, Chicago.

Pathology, Bacteriology and Biochemistry

SKIN INFECTION OF RABBITS WITH HEMOLYTIC STREPTOCOCCI ISOLATED FROM A PATIENT WITH ERYSIPELAS. 1. METHOD OF DEMONSTRATING PROTECTIVE ACTION OF IMMUNE SERUMS. THOMAS M. RIVERS, J. Exper. Med. **41**:179, 1925.

Hemolytic streptococci isolated from a human case of erysipelas were injected intracutaneously in varying doses into the shaved areas on the chest and abdomen of rabbits. Marked reactions appeared about the sites of the injections of the heavier suspensions. These lesions were usually phlegmons or abscesses, in some cases with a surrounding spreading inflammation having many of the characteristics associated with human erysipelas.

With the purpose of producing an immune serum, seven rabbits were given intracutaneous injections of the streptococci, repeated after ten days and weekly thereafter until seven injections had been given. Eight days later the animals

were bled, the serums pooled, inactivated and placed on ice. Serums from seven normal rabbits were pooled to be used for control purposes.

One portion of each of a series of dilutions of a suspension of the streptococci was mixed with immune serum and a second portion with normal serum and these mixtures were injected immediately into the skin of the same rabbit. At the sites of the injections of the mixture of immune serum and streptococci only a slight redness was seen two days later. Injections of the mixture of normal serum and streptococci produced large lesions, similar to those which occurred after injection of the streptococci alone.

The author suggests the possibility that this method of demonstrating the immune properties of antistreptococcus serum may be of value, not only in determining the potency of serums for therapeutic purposes, but for tests of the specificity of different strains of the streptococcus and for the solution of certain obscure facts concerning immunity to streptococci.

LOCAL PASSIVE IMMUNITY IN THE SKIN OF RABBITS TO INFECTION WITH A FILTRABLE VIRUS, AND WITH HEMOLYTIC STREPTOCOCCI. THOMAS M. RIVERS and WILLIAM S. TILLETT, J. Exper. Med. **41**:185, 1925.

Intracutaneous injection of the virus failed to produce visible lesions in the skin of rabbits in areas infiltrated with immune (antivirus) rabbit serum from twenty-four to forty-eight hours previously, while lesions were produced by virus injected in areas not so infiltrated and in areas infiltrated with normal serum. From these results it seems reasonable to conclude that a local passive immunity was produced by the infiltration with immune serum.

Working with a streptococcus originally obtained from a case of human erysipelas, which when injected intracutaneously into the normal skin of rabbits produced definite lesions, it was found that skin areas, infiltrated with meat infusion broth or normal rabbit serum twenty-four hours previously, possessed considerable local protection against intracutaneous injections of this micro-organism.

Comparison of the effectiveness of normal serum and immune serum in a typical experiment showed that when the streptococci and immune serum were mixed and immediately injected into the skin no lesion was produced, while injection of a mixture of the streptococci and normal serum caused a large phlegmon around which a lesion similar to erysipelas developed. Furthermore, no lesion developed following injection of streptococci into a skin area that had been infiltrated with immune serum twenty-four hours previously, whereas in areas infiltrated with normal serum inoculation was followed by definite lesions. The greater protection afforded by the infiltration with the immune serum seemed to justify the conclusion that a local passive immunity was conferred by it. The authors state that it seems obvious that a local passive immunity can be induced and will exist sufficiently long to be of value in the prevention of certain local infections in the skin, and that one might conceivably treat a local hemolytic streptococcus infection by infiltration of the healthy tissues in the immediate vicinity with immune serum, on the assumption that when the infection reached the prepared zone it would be unable to progress further.

RESISTANCE TO SPONTANEOUS MOUSE CANCER INDUCED BY INJECTIONS OF OLEIC ACID. WARO NAKAHARA, J. Exper. Med. **41**:347, 1925.

Intraperitoneal injection of an emulsion of oleic acid interfered with the growth of spontaneous mammary cancers in mice, as shown on comparison

with controls, by lessened incident of local recurrence and of metastases and new primary tumors after attempted complete surgical removal, and as more strikingly demonstrated by diminished frequency of takes of autoplastic tumor grafts. There was also an increased average postoperative longevity in the treated animals as compared to the controls.

Histologic examination of the sites of the autoplastic grafts showed in the treated mice an increased activity of connective tissue and lymphocytes with frequently an early and active invasion of the autologous cancer graft by connective tissue cells, an invasion practically never seen in normal autotransplantation.

The author states that a possible starting point in an attempt to discover a chemical agent that will produce general changes in the animal body, which may militate against the proliferation of malignant cells is suggested by this investigation.

FOCAL INTERSTITIAL NEPHRITIS IN THE CALF FOLLOWING INTERFERENCE WITH THE NORMAL INTAKE OF COLOSTRUM. THEOBALD SMITH, J. Exper. Med. **41**:413, 1925.

Pfenninger and Krupski, and the author have independently reached the conclusion that *Bacillus coli* is the dominating bacteriologic factor in the production of a focal interstitial nephritis (the spotted kidney of European observers) found in young calves during the first or later months of life.

As evidence of the association of the nephritis with another factor, namely, colostrum deficiency, the author presents the following: 1. The occurrence of fatal *Bacillus coli* septicemia following exclusion of colostrum from the diet. 2. The sterility of the kidney tissue in calves fed colostrum early and in sufficient quantity. 3. The actual production of the spotted kidneys in calves which either have had no colostrum and have survived the early septicemia, or else have had the intake of colostrum modified in some way.

At present there is no necropsy record of the occurrence of spotted kidneys in any calf normally fed with colostrum. The existence in the herd or environment of special, more virulent types of *Bacillus coli* is a necessary antecedent of the nephritis.

McCLURE, Evanston, Ill.

CLASMATOCYTES AND PASSIVE IMMUNITY TO STREPTOCOCCUS INFECTION. VI. STUDIES IN STREPTOCOCCUS INFECTION AND IMMUNITY. FREDERICK P. GAY and ADA R. CLARK, J. Infect. Dis. **36**:233, 1925.

Rabbits may be protected against streptococcus empyema produced by many multiples of the normally fatal dose, when an immune serum from rabbits is injected intrapleurally the day before infection and simultaneously with the streptococcus. Normal rabbit serum in the same doses also protects the majority of animals.

The mechanism of the preventive effect differs in the two instances. The first injection of either serum produces the same increase of cells in the pleural cavity, and in both instances the relative proportions of clasmatocytes, polymorphonuclears and lymphocytes are the same.

In the immune serum animals, sterilization of the infected cavity is rapid, being complete in three hours or less; this sterilization is accompanied by a critical rise in both clasmatocytes and polymorphonuclear cells. In normal serum animals, there is a drop in the clasmatocytes, and both clasmatocytes and polymorphonuclears rise slowly to reach their respective maxima in about

twelve hours. The clasmatocytes never reach the level obtained in the immune serum animals, whereas the polymorphonuclears rise to twice the maximum of the immune series. Sterilization in the normal serum rabbits does not occur until the second or third day.

The authors feel that these results, together with former observations on the enhancing of natural resistance to streptococcus, indicate that the clasmatocytes are the significant cells in experimental streptococcus infections.

They have been wholly unable to parallel in the test tube the results obtained in the animal body. The pleural cavity of an immune serum prepared animal that has become sterile and is capable of still further destruction of streptococcus contains a fluid that has no manifest bactericidal properties under the conditions of their experiments.

KENNEDY, Rochester, Minn.

THE RELATION BETWEEN THE PROTEIN AND THE CALCIUM CONTENT OF THE SERUM. ZOLTAN VON BOKÀY, Jahrb. f. Kinderh. **108**:93, 1925.

The protein content of the serum varies from 5.11 per cent. in infancy to 9.45 per cent. in children, aged from 12 to 14 years. The highest values occur in children with tuberculosis, pleurisy, osteomyelitis and malaria.

The lower protein content is associated with a total calcium of from 9 to 10 mg. per hundred cubic centimeters; the higher protein content with a calcium of from 10 to 11 mg. per hundred cubic centimeters. In individual cases the total calcium varies with the protein. The total calcium is such that the calcium ion concentration remains constant. The nondialyzable calcium is about 37.8 per cent.

THE DIFFUSIBLE ALKALI CONTENT OF BLOOD SERUM OF HEALTHY AND SICK CHILDREN. JOSEF CSAPO, Jahrb. f. Kinderh. **108**:112, 1925.

The author developed his own method of determining the diffusible alkali, expressing the quantity in terms of fiftieth normal alkali, and used Pulfrich's refractometer method for the protein. The alkali-protein quotient is the diffusible alkali in 1 c.c. of serum divided by the percentage of protein, and multiplied by 100.

In normal children, the diffusible alkali is 1.95 c.c. of fiftieth normal alkali; the quotient is 24.6. The diffusible alkali is made up of the free alkali (one-third) and the dialyzable alkali (two-thirds), and changes with the protein content of the serum. In tuberculosis, rickets, syphilis, purpura simplex and febrile infections the diffusible alkali and the quotient are decreased. In chorea minor there is no change from the normal. In scarlatina there is a slight increase in the quotient; in morbus maculosus Werlhofii a distinct increase.

The diffusible alkali gives a measure of the reserve alkali of the blood serum.

THE QUESTION OF ENTERAL SALT FEVER. LUCIE FIEGEL, Jahrb. f. Kinderh. **108**:122, 1925.

The giving of 100 c.c. of sodium chlorid by mouth caused a fever in 63 per cent. of nineteen normal infants. These were artificially fed, and for the most part were under 4 months of age. It was necessary to give the solution by stomach tube. A decided reaction was the rule only with ill or poorly developed children. The comparison of the temperature curve and the curve of sodium chlorid in the blood serum shows that the salt does not act directly from the blood in causing the fever, since the curve of sodium chlorid in the serum was low at the time the fever was high.

The author apparently does not consider the possibility of this being a dehydration fever, either in his discussion of the literature or in his own experiments.

SUTHERLAND, Chicago.

INVESTIGATIONS CONCERNING THE EFFECT OF HEMOLYZED AND UNCHANGED BLOOD. FELIX METIS, Monatschr. f. Kinderh. **29**:199, 1924.

In experiments on animals made anemic by repeated bleeding, and with diet and conditions well controlled, Metis endeavored to see if there was a difference in the blood findings following injections of hemolyzed and non-hemolyzed blood. In both dogs and rabbits he found that following intraperitoneal injections of hemolyzed blood, the improvement was only gradual, while following the use of whole blood the improvement was noticeable at once.

GERSTLEY, Chicago.

IS IT POSSIBLE TO APPLY SERUM DIAGNOSIS TO GROWTH STIMULATION IN THE UTERUS? F. BINZ, München. med. Wchnschr. **71**:899, 1924.

A malignant ovarian tumor, apparently the cause of precocious puberty, was obtained from a child, aged 2 years. Juice from this tumor was injected into white mice, with the result that the uerus increased in size, particularly in length. The contents of ovarian cysts, when injected, did not have this effect, while that of a parovarian cyst did. Blood serum from several pregnant women when injected into a mouse stimulated the growth of the uterus so that the increase in thickness was the prominent feature.

STUDIES IN COLLOID THERAPY IN EXPERIMENTAL ANIMALS. H. BECHHOLD, München. med. Wchnschr. **71**:971, 1924.

Mice infected with *Bacillus suisepticus* die much sooner when kept in an incubator at 37 C. Mice which have recovered spontaneously or after administration of colloids from such an infection and are apparently entirely well may die in less than twenty-four hours when kept in the incubator. From such animals the bacillus may be recovered, but the virulence seems to be decreased. No bacilli of suisepticus could be recovered from animals having survived an infection without putting them in the incubator. He believes that these experiments furnish the first proof of the provocation of a latent infection by a climatic factor (heat).

BLOOD SUGAR STUDIES. E. SAENGER and H. MOMMSEN, München. med. Wchnschr. **71**:1427, 1924.

Intravenous injection of a proprietary product claimed to contain casein in solution and of fresh citrate blood in nondiabetic children led to a diminution of the blood sugar, while fresh citrate blood taken from an atrophic infant with low blood sugar had hardly any effect. Fresh carrot juice was given by mouth and by rectum to a child with severe diabetes. The blood sugar was markedly reduced. The hyperglycemia of normal children was not influenced on administration of dextrose. A preparation claimed to contain vitamins A and B in powder form, administered by enema to a child with severe diabetes, reduced the blood sugar. Cod liver oil injected intravenously in an infant blinded by keratomalacia reduced the blood sugar somewhat. It is concluded that vitamins introduced into the body of normal persons (and those with diabetes), orally, rectally or intravenously exercise an influence on the fasting blood sugar.

AMBERG, Rochester, Minn.

THE ALKALI RESERVE OF THE BLOOD AND ITS RELATION TO BLOOD SUGAR IN PARASYMPATHETIC POISONING. UMANA TORRES, Ztschr. f. d. ges. exper. Med. **37**:123, 1923.

A number of different studies have confirmed the observation that injections of pilocarpin increase the amount of sugar in the blood.

Other observations have shown that an acid metabolism seems also to have the property of mobilizing glycogen in the liver.

The writer's problem was to investigate the effect of pilocarpin as to its effect on any increased acid production in the blood.

The experiments were divided into two groups. In the first, the author gave doses of pilocarpin and of physostigmin and determined the effect on blood reaction. Moderate doses had no effect but large amounts did increase the blood acidity to some extent but this increase had absolutely no relation to increased blood sugar.

In a second series, he fed animals acids in considerable quantity but again he found no relation between blood acidity and blood sugar.

In human beings, pilocarpin in doses of 0.3 mg. per kilogram have no effect on the reaction of the blood.

As the reaction of the urine is less acid after pilocarpin injections, he believes its effect is not that of an acid but rather as a drug producing acapnia.

GERSTLEY, Chicago.

Nutrition

SELECTION OF SUGARS IN INFANT FEEDING. R. G. FLOOD, Arch. Pediat. **42**:50, 1925.

The common sugars used in infant feeding fall into two main groups, with honey occupying an intermediate position. Group 1 comprises those sugars which, when completely hydrolysed, give only dextrose, namely, dextrose, maltose, and karo corn syrup. Clinically, they are noted for their ease of absorption and nonlaxative action. They are the ideal sugars for bottle fed babies under 6 months. Group 2 comprises lactose and cane sugar, which are slowly or not entirely absorbed in the new-born and have a laxative action, especially sucrose, but are more readily utilized with advancing age. Honey, a mixture of dextrose and levulose, is readily absorbed and has a moderate laxative action.

VON MEYSENBUG, New Orleans.

THE EFFECT OF HIGH FAT DIETS ON THE CONTENT OF URIC ACID IN BLOOD. VICTOR JOHN HARDING, KATHLEEN DREW ALLIN, BLYTHE ALFRED EAGLES and H. B. VAN WYCK, J. Biol. Chem. **63**:37, 1925.

High fat diets produced an increase in the uric acid content of the blood of human subjects simultaneously with a ketosis. When carbohydrate or protein diets were given, the uric acid content of the blood became normal. This increase in some cases may be accounted for by decreased blood volume and consequent decreased elimination.

PRESENCE OF THE ANTISCORBUTIC SUBSTANCE IN THE LIVERS OF CHICKENS FED ON SCORBUTIC DIETS. CAREY W. CARRICK and SIGFRED M. HAUGE, J. Biol. Chem. **63**:115, 1925.

Chickens fed for several months on a diet free of vitamin C did not develop scurvy. The liver and kidneys of these birds contained antiscorbutic substance, as shown by the findings that guinea-pigs with scurvy were cured

when these organs were fed to them. The hen seems similar to the rat in not readily developing scurvy.

MINERAL DEFICIENCIES OF MILK AS SHOWN BY GROWTH AND FERTILITY OF WHITE RATS. AMY L. DANIELS and MARY K. HUTTON, J. Biol. Chem. **63**:143, 1925

Rats fed exclusively on cow's milk seldom reproduce, then only a small proportion of the young survive. Seven grams of soy bean powder per liter of milk will overcome this failure. The authors believe that the failure to reproduce was due to deficiency of mineral salts normally present in milk in only small amounts. When manganese, fluorin, aluminum and sodium silicate were added to milk, the animals reproduced normally. When one or more of these four salts were omitted, the results were not so good.

HIGGINS, Cincinnati.

NEWER CLINICAL SIGNS OF EARLY RICKETS. C. ULYSSES MOORE, J. A. M. A. **83**:1469 (Nov. 8) 1924.

Craniotabes was demonstrated in 60 per cent. of winter babies in the first four months of life, and is most easily determined at the mastoid fontanel. Associated with or following this softening is prominence of the parietal bosses and flattening of the posterior and posterolateral portions of the head. Among abnormalities of the chest indicating rickets are the square, triangular and oval forms as measured at the plane of the fifth costochondral junction. Costomalacia, or softening, of the sternal ends of the ribs is an important clinical sign in the first four months. Abnormal lateral motility of the knee joint is often the first clinical sign of rickets demonstrable in the legs and always precedes genu valgum and genu varum. Abnormal knee motility is of value in the early diagnosis of rickets and furnishes a means of measuring improvement during treatment.

THE UNDERLYING CAUSE IN THE PATHOGENESIS OF RICKETS. LEONARD FINDLAY, J. A. M. A. **83**:1473 (Nov. 8) 1924.

There are at least five factors that influence ossification, namely: sunlight, exercise, vitamin X, calcium and phosphorus, but Findlay feels convinced that the true or exciting cause of rickets has not been disclosed as yet. Since calcium and phosphorus are essential for the formation of bone, it is not to be wondered that their relative absence in the diet impairs the process of ossification. Much controversy has circled around the existence of such a substance as an antirachitic vitamin, called by Park the vitamin X, and its relationship to the fat-soluble A factor. Recent work has proved that though frequently associated, fat-soluble A and vitamin X, if such really exist, are independent substances. Because cod liver oil cures rickets, there is no reason to conclude that the disease is due to the absence of any active principle which it may contain. If this were true then all diseases for which there are specific remedies could be classed as deficiency diseases. Furthermore, cod liver oil is not a natural food of the infant. Findlay's experience that the influence of cod liver oil on rickets is not invariable, and that the disease may progress during the course of cod liver oil therapy can be subscribed to by many. His most serious criticism of cod liver oil therapy is that though the bones, as revealed by roentgen-ray examination, may become fully and normally calcified, the children remain as incapacitated as ever. He is of the opinion that absence of sunlight is not the potent factor in the pathogenesis

of rickets that some writers suggest, and cites several examples to uphold this opinion. The advocates of sunlight are not agreed regarding the particular rays which possess the protective power. It is Findlay's experience that the most rapid effect of radiant energy was in response to roentgen rays. The most striking feature in rickets is the deficient calcium content of the skeleton and the metabolism of calcium is the kernel of the whole problem. The fact that the child receiving an adequate amount of calcium in the food should have bones poor in this element may be explained on the basis of an insufficient absorption of the mineral, an abnormality in the transportation of the mineral elements, or an inability of the growth centers to retain it. Were rickets solely a process of decalcification the shaft would be poorest in calcium, whereas examination shows that the growing ends and periphery of the shaft suffer the greatest deprivation. The author believes that the failure of the intestine to absorb sufficient calcium is the crux of the whole matter, and is probably due to increased excretion. Under proper conditions Findlay has found in rickets the retention of calcium to be less than in health, and to be erratic, but in no instance was a negative balance present. It was observed that during the period of feedings low in calcium, the greatest amount of phosphorus was found in the urine. During active rickets there is not necessarily any impairment of the absorption of phosphorus. The disproportion between the loss of calcium and the loss of phosphorus was a striking feature of the experiments. One important aspect of this problem is the diminished excretion of calcium by the urine in rickets, but one must guard against magnifying the significance of the urinary excretion of calcium, as there are many factors involved which are not understood. Nevertheless, the urinary calcium bears a definite relationship to the amount retained. It is the opinion of the author that the calcium demanded by the tissues other than the bones is supplied by decalcification of previously formed bone. That rickets is of intestinal origin and probably of the nature of an infection is not a new idea. Findlay thinks it possible that there is some specific infection influencing the reaction of the intestinal contents in a special direction. In support of the intestinal origin of rickets he mentions some recent work, showing that while cod liver oil given subcutaneously, still exerts its growth-directing action it has no effect on calcification. Investigation of the proportion of the calcium rendered soluble during the process of digestion has shown that in health all calcium is soluble by the end of two hours, while in rickets only 90 per cent. is so changed. If it could be demonstrated that in the upper portion of the intestine there was an increased precipitation of calcium, another link would be furnished to support the idea that rickets is of intestinal origin.

RICKETS AS INFLUENCED BY THE DIET OF THE MOTHER DURING PREGNANCY AND LACTATION. ALFRED F. HESS and MILDRED WEINSTOCK, J. A. M. A. **83**:1558 (Nov. 15) 1924.

During the last few years, investigation into the etiology of rickets has been centered on nutrition and environment of the infant. Less attention has been paid to the hereditary and congenital factors. The authors have studied the question of influence of the diet of the mother on the subsequent development of rickets in her offspring. Judging from their experiments, it would seem that rickets cannot be prevented by improving the diet of the mother, (*a*) previous to pregnancy; (*b*) during pregnancy and throughout lactation, although it can be mitigated to a certain degree. Supplementing the diet of the mother for two generations also failed to render the young refractory.

Infants were not protected by administration of cod liver oil to the mother during the last two months of pregnancy. They seem to think that the fact that premature infants are markedly susceptible to rickets shows that prenatal nutrition does play a rôle. A consideration of the experimental evidence, of clinical tests, of the susceptibility of bottle fed compared to breast fed babies, and the striking seasonal incidence leads to the conclusion that rickets is chiefly of postnatal origin. While its incidence and severity may be influenced by the diet of the mother, the main efforts should be directed toward correction of postnatal factors.

CORRELATION OF CLINICAL, ROENTGENOLOGIC AND SEROLOGIC EVIDENCES OF RICKETS IN BREAST FED BABIES. L. R. DE BUYS and LUDO VON MEYSENBUG, J. A. M. A. **83**:1563 (Nov. 15) 1924.

The authors have attempted to determine which of the clinical signs of rickets are the reliable diagnostic ones by a study of sixty-eight infants, ranging in age from 4 to 44 weeks. The infants were examined for bosses, craniotabes, flaring ribs, beading, enlargement of epiphyses and bowed legs, in addition to roentgenographic examinations of the wrists and determination of the phosphate and calcium contents of the blood plasma. The positive roentgenographic findings, the positive clinical manifestations and the abnormal blood changes ran parallel. Enlargement of the epiphyses seemed to be the most dependable clinical manifestation of rickets and costal beading — the symptom next in importance. Craniotabes appeared so often and in such marked degree, regardless of the serologic and roentgenologic findings, as to be unreliable if considered alone. Moreover, this symptom is not dependable because of its appearance, as a rule, at an early age and because of its short duration. Cranial bosses, flaring ribs, and bowed legs are later changes. In the first twelve weeks of life, there are no blood changes indicative of rickets. From the twelfth to the twentieth week the blood changes are more pronounced and after this period there is a gradual return to normal. In respect to the seasonal variation of the blood phosphate, the lowest average occurred in March. Serologic examination of the blood, while it is the most reliable procedure for determining the activity of the disease is not always of practical application. Positive roentgenographic evidence is of decided value. The most dependable clinical signs are epiphyseal enlargement and costal beading.

ANTIRACHITIC PROPERTIES IMPARTED TO INERT FLUIDS BY ULTRAVIOLET IRRADIATION. ALFRED F. HESS and MILDRED WEINSTOCK, J. A. M. A. **83**:1895 (Dec. 6) 1924.

Investigations were carried out to ascertain whether, by means of irradiation, inert substances could be endowed with antirachitic potency. It was found that cottonseed oil and linseed oil, when irradiated for an hour at a distance of 1 foot with the mercury vapor quartz lamp, had acquired antirachitic properties. No results were obtained with irradiated liquid petrolatum. Failure was also recorded with water and linseed oil containing radium. Subcutaneous injections of radium water produced no results. Ozonated water was found to possess no protective action. No attempt is made to explain these results.

HUMAN MILK. B. RAYMOND HOOBLER, J. A. M. A. **84**:165 (Jan. 17) 1925.

The commercial production of human milk and its distribution in containers direct to the home have passed through the experimental stage. The details of a ten year observation of the Detroit burea of wet nurses are given, with

a view of encouraging other communities to take up this work. The cost of production and distribution, which includes the flat rate of 10 cents an ounce paid to producing mothers, has decreased each year until in 1923 it reached 15 cents an ounce. A charge of 30 cents an ounce is made when it involves no hardship, but in no case is a baby denied milk because of inability to pay for the milk. A certain rigid standard must be lived up to by the producing mothers. They must: (1) be healthy; (2) have a negative Wassermann reaction and be free from tuberculosis; (3) have clean personal habits; (4) live in a clean home; (5) nurse their own healthy babies up to 8 months; (6) express milk at least twice daily; (7) keep milk on ice until delivered; and (8) supply at least 16 ounces daily. No diet is stipulated, but one with a narrow protein ratio is recommended. The greatest percentage of infant mortality is among premature and sickly infants during the first month or two of life. Breast milk, if available, would save many of these lives. At present there seems to be no satisfactory substitute for breast milk at this early age, and there seems no better way to reduce the mortality than to increase the production of human milk. Every community supporting a maternity hospital should be a potential center for such a producing group.

THE ULTRAVIOLET RAYS OF THE SUN. ALFRED F. HESS, J. A. M. A. **84**:1033 (April 4) 1925.

The essential importance of ultraviolet rays, which constitute less than 1 per cent. of the total solar radiations, has just begun to be appreciated in medicine. Rickets affords an excellent criterion for the investigation of the biologic activity of the sun's rays, for we know within narrow limits the band of ultraviolet radiations that is effective in preventing or curing this disease. A comparison of the yearly amount of actual sunshine in cities in the temperate zone demonstrates that there is no close parallelism between the incidence of rickets and annual sunshine. It shows, furthermore, the occurrence of rickets does not depend on an equable distribution of sunshine throughout the year. In the Panama Canal Zone, where rickets is practically nonexistent, not only is the yearly sunshine less than in New York but it is less evenly distributed; there are fewer hours of sunshine during the rainy season in Colon or Ancon than during the corresponding winter period in New York. The determining factor is the quality, not the quantity, of the sun's rays — the amount and intensity of those short radiations which alone are of value in preventing rickets. The results of heliotherapy during the winter months have been disappointing, owing to the fact that the "antirachitic region of the solar spectrum" is very limited at this season and that the infants cannot be exposed directly to the rays on account of the severity of the climate. It would seem that the amount of the effective solar radiations is so small in the winter that even if we substitute quartz panes for ordinary window glass, it will be insufficient to afford protection and to eradicate rickets. The most promising prophylactic measures are ultraviolet light from artificial sources, and the use of cod liver oil or potent extracts of this oil. Possibly foods that have been activated by irradiation will prove to be of value in this connection; for example, dried milk that has been rendered antirachitic by this means. Something may be accomplished in this direction by improving the hygienic conditions of the milk.

BONAR, Salt Lake City.

ON THE VARIATIONS IN THE COMPOSITION OF NORMAL HUMAN MILK. J. ADDYMAN GARDNER and F. W. FOX, Practitioner **114**:680 (Feb.) 1925.

The object of this investigation was to determine: (1) what are the limits of variation of the constituents of a normal human milk in different individuals; and (2) how far the milk changes during the period of lactation.

Errors in analysis are mainly caused by inadequate sampling or by inaccuracy in the method of analysis. It is also of interest that the composition of milk varies at different times of the day so that the best time to take a sample for analysis is between 9 and 10 a. m. The methods of sampling, namely, a full twenty-four hour specimen, or the complete contents of one breast, have not been satisfactory. The method favored by the authors has been to take from 25 to 30 c.c. before nursing and a like quantity afterward, then to mix the samples. It has been demonstrated that there is a wide variation of certain constituents in different individuals, and that the milk in the early days of lactation is different from that in the later.

Diet, provided it be sufficient in quantity, has no obvious effect either quantitatively or qualitatively on the chief constituents. Age, state of nutrition, number of pregnancies, nationality and complexion have all been investigated, but without conclusive evidence.

In analysis of the milk, five periods were chosen: (1) colostrum (from 1 to 6 days); (2) colostrum (from 7 to 12 days); (3) transition (from 13 to 30 days); (4) mature (from 1 to 9 months); (5) late (9 months). The most striking result was found in the variation of the ether extract—the so-called fat content. In the last three groups, the figures were nearly identical. The colostral milk of the first week showed a value of approximately 75 per cent. of the average, and of the second period, about 86 per cent.

The protein showed a fairly steady decrease throughout the five periods.

Carbohydrate shows wide variation in individuals, but the average figures of all groups are of about the same order.

The ash shows a steady decrease.

The fat, protein and carbohydrate show an irregular variation from day to day; nevertheless, the analysis of a sample such as described above, after the early period of lactation, all give an approximately correct picture.

There appears to be no relation between the quantity of milk and its composition. The so-called fat contains in addition to true fat, small percentages of cholesterol esters, lecithin, etc.

The proteins consist of caseinogen, albumin and globulin.

There appears to be no relation whatever between the percentages of fat and of total cholesterol in individual cases. Although the percentage of cholesterol in human milk is much lower than that in cow's milk, the relative proportions of the constituents are of much the same order.

There is no sound opinion possible from the published analysis to date as to the calcium content of the milk from the mothers of rachitic children.

GELSTON, San Francisco.

PATHOGENESIS OF ACUTE ALIMENTARY NUTRITIONAL DISTURBANCES. PART 14. THE FERMENTATION OF COW'S AND HUMAN SKIMMED MILK BY FERMENTATION ACIDS PRODUCED BY B. BIFIDUS COMMUNIS. WERNER CATEL, Jahrb. f. Kinderh. **107**:347, 1925.

Earlier work on *B. bifidus* gave the impression that it produces little fermentation. However, definite data are scarce. The writer found a definite fermentation in twenty-four hours with the *B. bifidus* in cow's milk under

anaerobic conditions; more than with *B. coli* and enterococci in the same medium. *B. bifidus* produced lower fatty acids and lactic acid in the proportion of 3 to 1. In breast skimmed milk, the amount of fermentation acids is less than with cow's milk.

AMIN FORMATION IN THE INFANT'S INTESTINE AND THE RÔLE OF AMINS IN INFANTILE INTOXICATION. HUGO MEYER and E. ROMINGER, Jahrb. f. Kinderh. **108**:40, 1925.

A biologic method was used to determine the presence of toxic amins such as beta imidizolethylamin, histamin, etc. A strip of living guinea-pig intestine was used as the test object; as a control a 1:20,000,000 solution of histamin was used.

Amins were present in the intestine of healthy and sick infant's but it was not possible to bring the amins into definite relation with nutritional disturbances. Amin formation was the rule in bottle fed babies and the exception in breast fed. Amins were present in the intestine on a feeding of cow's milk which coagulates in coarse flakes, and was not present when the milk is coagulated in fine flakes.

Amin formation in the intestine cannot be considered as a primary pathogenetic factor in the nutritional disturbances of infancy. Intoxication is not identical with secondary amin formation, since amins are not present in the blood stream and urine of intoxication cases, while they are found in these fluids in experimental amin poisoning in animals.

PROTEIN DIGESTION IN THE INFANT'S STOMACH. S. ROSENBAUM and M. SPIEGAL, Jahrb. f. Kinderh. **108**:87, 1925.

The method used was to give a feeding by bottle to a normal infant, and remove a sample through a sterile stomach tube at the height of digestion one and one-half hours later. A part of this was taken as a control and the rest incubated for several hours at 37 C. By this method errors due to loss of substance into the duodenum and addition of bile or gastric secretions with their protein content are obviated. The results are given as the percentage of nitrogen in the filtrate before and after the incubation period.

There was no digestion of breast milk in from seven to ten hours when tested in this way. There was digestion of cow's milk when given in a concentration of one-half milk or more. The writer concludes that there is no proteolytic digestion of breast milk and very little of cow's milk in the period of three or four hours in which the milk is in the infant's stomach.

SUTHERLAND, Chicago.

Diseases of the New-Born

STUDIES ON THE BLOOD OF THE NEW-BORN. R. POLLITZER, Pediatria **32**:1144, 1925.

Pollitzer, in a study of the blood of thirty-two normal infants, draws the following conclusions: 1. The blood of the new-born is abnormally rich in cellular elements and hemoglobin; in the first few days of life, nucleated red cells are found. The red cells vary between five and six and a half million;

the white cells from nine to twenty thousand and the hemoglobin from 98 to 135 per cent. 2. The number of neutrophils decreased from 66 per cent. on the first day of life to 57 per cent. on the sixth day, while the lymphocytes increased from 25 to 40 per cent. 3. Bone medulla at birth contains more premature red than white cells; in the succeeding days the reverse condition becomes true. The increase in the number of white cells in the medulla coincides chronologically with the diminution in the number of the polymorphonuclears in the blood. 4. In general, there seems to be an inverse ratio between the number of cellular elements in the blood and the number of premature cells in the bone medulla. This is not true of the eosinophils which are found in proportionate numbers both in the blood and in the medulla.

DE SANCTIS, New York.

Acute Infections

A METHOD OF RECOGNIZING SCARLET FEVER STREPTOCOCCI BY MEANS OF SPECIFIC TOXIN PRODUCTION. GEORGE F. DICK and GLADYS H. DICK, J. A. M. A. **84**:802 (March 14) 1925.

After the production of experimental scarlet fever, the authors were able to explain the lasting immunity by the discovery of the specific toxin produced by the streptococci growing in the throat. Absorption of the toxin producing the characteristic symptoms of scarlet fever and recovery with subsequent immunity are due to the production of an antitoxin capable of neutralizing the toxin. Morphologically, the streptococci of scarlet fever are indistinguishable from streptococci of other sources and the staining reactions are not characteristic. The appearance of the colonies on blood agar plates is too variable to furnish a means of differentiation. A study of the toxin production of hemolytic streptococci affords a method of recognizing those organisms that are capable of producing scarlet fever. The organism is isolated in pure culture, and grown in plain broth, containing 1 per cent. sterile defibrinated sheep's blood. The authors have been using broth prepared with Witte's peptone, 1 per cent., and Liebig's meat extract, 0.3 per cent. By the addition of a small amount of blood, a somewhat stronger toxin is produced by the organisms. After from two to four days incubation the broth culture is filtered through filter paper and then passed through a Berkefeld filter. The sterility of the filtrate is determined by culture and it is kept in a refrigerator. A part of the filtrate is diluted 1:500 in sterile physiologic sodium chlorid solution. One cubic centimeter of this dilution is mixed with an equal amount of salt solution and another 1 c.c. is mixed with 1 c.c. of sterile convalescent serum. Both mixtures are incubated for one hour, and skin tests made on a person known to be susceptible to scarlet fever, using 0.1 c.c. of each mixture. At the same time, a control test is made with 0.1 c.c. of the standardized skin test solution used to determine susceptibility to scarlet fever. The reactions are observed at the end of twenty-four hours when the control should be positive. If the mixture of filtrate with salt solution gives a positive reaction, while the filtrate convalescent serum mixture gives negative results, it may be concluded that the organism under consideration is capable of producing a toxin that is neutralized by convalescent scarlet fever serum and is therefore a scarlet fever streptococcus. Occasionally a toxin will give a stronger

reaction than the control, and it may be necessary to make a higher dilution of the filtrate to obtain complete neutralization with convalescent serum. Variability of the antitoxin content of convalescent serums or tardy release of the toxin, may cause a negative reaction at twenty-four hours and a positive at forty-eight hours. If the test is negative, lower dilutions should be used until it is conclusive that the organism is incapable of producing the specific scarlet fever toxin. Concentrated scarlet fever antitoxin may be substituted for convalescent serum in these tests.

THERAPEUTIC RESULTS WITH CONCENTRATED SCARLET FEVER ANTITOXIN. GEORGE F. DICK and GLADYS H. DICK, J. A. M. A. **84**:803 (March 14) 1925.

The method of producing a concentrated scarlet fever antitoxin and the method of standardizing the antitoxin is described. The results in the antitoxin series and in the control series, reported here, indicate that concentrated scarlet fever antitoxin, injected intramuscularly, blanches the rash, lowers the temperature and improves the general condition of many scarlet fever patients. If the antitoxin is given early the course is shortened and the incidence of complications and sequelae are greatly diminished. One therapeutic dose suffices in early cases of moderate severity. The concentration of the antitoxic serum and its exact standardization makes it of practical use as a routine measure in the treatment of scarlet fever. Of the thirty-five patients with moderately severe fever not given antitoxin, postscarlatinal nephritis occured in 8.5 per cent., otitis media in 14.2 per cent., mastoiditis and otitis in 8.5 per cent. and severe cervical adenitis in 2.9 per cent. Of the twenty-one patients with moderately severe fever receiving antitoxin, the only complication was otitis media in 4.7 per cent. No deaths were recorded on this series. Of fifteen patients severely ill receiving no antitoxin, there was postscarlatinal nephritis in 20 per cent. The mortality was 20 per cent. Of twenty-nine patients severely ill, otitis media was observed in 6.8 per cent., mastoiditis, otitis and severe cervical adenitis in 3.4 per cent. each. The mortality of 3.4 per cent. was due to a neglected mastoid infection.

DICK TEST AND IMMUNIZATION AGAINST SCARLET FEVER. O. B. NESBIT, J. A. M. A. **84**:805 (March 14) 1925.

Dick tests were made on 2,162 school subjects, 927 males and 1,235 females. Among the males 40 per cent. were positive, 9 per cent. were slightly positive and 50 per cent. were negative. With the females 40 per cent. were positive, 12 per cent. were slightly positive and 48 per cent. were negative. Seven per cent. reported having had scarlet fever and of these 28 per cent. were positive, 12 per cent. were slightly positive and 60 per cent. were negative. No cases of scarlet fever have been reported among the Dick negative group while two were reported among the Dick positive group. The severest reactions were three cases of urticaria, two being in adults. This condition developed soon after administration of the toxin. One pupil had a rash that was ascribed to the toxin by the family physician. The author concludes that the Dick test appears to be a satisfactory method of determining persons susceptible to scarlet fever. Immunization of any group of schoolchildren without previous tests is not justified as a routine. The three doses of scarlet fever toxin given appeared to immunize about 65 per cent. of the pupils. The group found to be

still slightly positive on retesting was probably largely immune, but to determine this, final tests with controls are needed. No immunity against German measles is developed in persons after scarlet fever toxin injections. Larger immunizing doses of scarlet fever toxin are desirable.

BONAR, Salt Lake City.

DIPHTHERIA. A. A. PACE, J. Iowa State M. S. **15**:142 (March 10) 1925.

The author reviews the ravages of the disease before the development of antitoxin, and the anxiety of the parents when antitoxin was first administered.

Diphtheria at the State Juvenile Home at Toledo was almost constant before the introduction of the toxin antitoxin. The first efforts to eliminate the condition were to use the Shick test and immunize all who showed a positive reaction. Occasionally, a patient who had shown a negative Shick reaction would develop diphtheria. A decision made one year ago to administer toxin antitoxin to all who entered the institution has entirely eliminated the disease therefrom. The author's conclusion is that diphtheria can be nearly or completely eradicated by the proper administration of toxin antitoxin.

TURNER, Des Moines, Iowa.

FURTHER OBSERVATION ON THE USE OF CONVALESCENT SERUM IN THE PROPHYLAXIS OF MEASLES. GEORGE H. WEAVER and T. T. CROOKS, Wisconsin M. J. **23**:555, 1925.

The results of a previous work with convalescent serum as a prophylactic against measles and also some of the most recent literature are reviewed.

The present report deals with an additional series of 100 susceptible exposed children, who were given convalescent measles serum in a uniform dosage of 5 c.c. Many of these children were drawn from the private practice of physicians.

Of these children eighty-one were entirely protected; nine developed mild atypical measles and ten had typical measles. Of the ten developing typical measles only three had been given serum within five days of exposure.

With a uniform dosage of 5 c.c. was found some evidence that the protection afforded increased as age decreased. This would seem to indicate that a dose graduated to age might be advisable at times.

If accurate standardization of dose and time of administration were possible, it would perhaps be preferable in many cases to administer just that amount of serum which would admit the development of a mild abortive attack of measles. This would confer a permanent active immunity instead of a few weeks of passive immunity.

The degree of protection of the convalescent serum was found to be about the same in institutional cases and in those from private practice.

The protective power of whole blood from persons who have had measles some time previously seems fairly well established. When convalescent serum is not available, the injection of whole blood may be used by the general practitioner.

KASTNER, Milwaukee.

THE INFLUENCE OF METEOROLOGIC VARIATIONS ON THE INCIDENCE OF CEREBRO-SPINAL MENINGITIS. G. GUERRIERI PALEOTTI, Ann. D'Ig. sper. **5**:341, 1924.

The relationship between meteorologic conditions and cerebrospinal meningitis as studied by Compton in 1916, prompted the author to make a similar

independent study in Italy. He chose 1916 as the year to study because during this time the cities of Rome and Bologna suffered epidemics of this disease. The factors investigated by Paleotti were: relative humidity, pressure, temperature and rainfall.

The cases considered totaled 208 in Rome and fifty-seven in Bologna. He found that the majority of these cases occurred during the months when the relative humidity was highest; the atmospheric pressure low (this fact was more in evidence in Rome than in Bologna); the temperature was also low (he further stressed the fact that the difference between the highest and lowest temperature was also very small) and the rainfall was also greatest.

These findings correspond with the atmospheric conditions which prevailed during the 1905 epidemic in Bologna and that of 1915 in Rome. Paleotti concludes by saying that these findings contribute little to known epidemiology of cerebrospinal meningitis but simply serve to confirm the known fact, that the disease is most prevalent during the winter months and that any attempts at prophylaxis must be directed in some other direction.

ZAMBARANO, Washington, D. C.

MALARIAL NEPHRITIS IN INFANCY. S. MAGIORE, Pediatria **32**:1258, 1925.

Magiore reviews 130 cases of children with malaria. Kidney disturbances were relatively common in the series; 23 per cent. of the children showing some renal complication. The most frequent condition noted was albuminuria and cylinduria; real nephritis or nephrosis were rare. In infants, acute interstitial nephritis was observed.

ETIOLOGY OF VARICELLA. L. AURICCHIO, Pediatria **32**:1310, 1925.

Auricchio, in twenty cases, isolated a minute gram-positive coccus or diplococcus from the blood and contents of the vesicles and pustules at various periods of the disease. The organisms, cultivated on Di Cristina's and Tarozzi-Noguchi mediums, were filterable. The serum of the patients gave agglutination and complement-fixation reactions, beginning from the fifth day of the disease. The inoculation intravenously in young rabbits of a culture of the organisms isolated did not cause any eruption in the animals injected.

DE SANCTIS, New York.

THE PREVENTION OF CHICKENPOX. ZOLTÁN V. BARABÁS, Jahrb. f. Kinderh. **107**:343, 1925.

In four series of cases in which material from new vesicles was rubbed into the skin of exposed children, those so treated did not develop chickenpox, nor did the controls. In another series there were a number of cases both among those inoculated and those not inoculated, with no difference in the severity. Rubbing the watery material from the vesicles onto the mucous membrane did not produce chickenpox, so that the infecting agent is not in these vesicles. In a few cases vesicles developed on the skin at the site of the inoculation.

Serum from patients convalescing from chickenpox was injected into forty-two children who had been exposed. The usual dose was from 10 to 15 c.c. Five, or 11.9 per cent., of these children developed chickenpox, two before the tenth day and the remainder before the fifteenth day. Of these, one was

given 5 c.c., two were given it five or six days before exposure, and one was given serum taken from a patient six weeks after he had had chickenpox. The writer, therefore, favors the use of convalescent serum, with emphasis on the using of a large dose of serum from a patient recently recovered (from three to four weeks) from the disease.

INTRACUTANEOUS AND SUBCUTANEOUS POCK INOCULATION. JULIUS SIMKO, Jahrb. f. Kinderh. **108**:102, 1925.

One hundred seventy inoculations were made by the intracutaneous method, using 0.1 c.c. of a 1:40 dilution of vaccine. The needle was inserted subcutaneously and then pushed back intracutaneously. This method resulted in papule but no pustule formation, unless more concentrated solutions were used. In from four to six weeks the papule subsided, leaving no scar. Fifteen of these cases tested by the ordinary cutaneous method from three to four weeks later failed to "take," showing that the previous method had resulted in the development of immunity.

Subcutaneous injection was used in ninety children, using 1:50 or 1:60 dilution, and injecting 0.1 c.c. in each of two places. Ten of these were later tested by the cutaneous method, and two developed a pustule and a febrile reaction.

The intracutaneous method was thus effective, without the production of a scar.

SUTHERLAND, Chicago.

DIPHTHERIA OF THE SKIN IN INFANCY. ILSE REINHARDT, München. med. Wchnschr. **71**:610, 1924.

A case is reported in which diphtheria bacilli were found in ulcers of the skin in the region of the occiput and in the facial eczema. The infant, aged 8 months, was severely ill and died. There was no postmortem examination, but death was attributed to diphtheria intoxication. Three other cases are mentioned of infants with ulcerations of the skin due to diphtheria bacilli.

THE TREATMENT OF DIPHTHERIA. KURT OCHSENIUS, München. med. Wchnschr. **71**:616, 1924.

The author lays stress on two points with regard to diphtheria. The first is early diagnosis on the basis of clinical findings; the second is administration of large doses of antitoxin.

PROPHYLAXIS OF MEASLES. BRÜGGER, München. med. Wchnschr. **71**:858, 1924.

The author concludes: (1) The day of the eruption of the measles' exanthema in a child does not always designate the fourth day of incubation for those children infected by the patient. It may be the fifth, sixth or even the seventh day. The dose of 3 c.c. of reconvalescent serum for measles protection given the fourth day of incubation does not always suffice; (2) the protection can disappear after four weeks; (3) in case reconvalescent serum cannot be obtained, the serum of adults can be given in doses of 30 c.c. or more. The mortality of the last measles epidemic in those children who were treated was less than half that in those who were untreated; (4) hospitals with large services for infectious diseases should keep as much measles reconvalescent serum on hand as possible.

SEVERE "INTESTINAL GRIPPE" IN INFANTS. A. UFFENHEIMER, München. med. Wchnschr. **71**:1021, 1924.

A number of cases (ten) of severe intestinal disturbances occurred within a relatively short time. Five of these patients died. Some of the infants were on the breast. All were doing well and became acutely ill. It seemed to be a parenteral infection and the diagnosis of "intestinal grippe" was made, although reluctantly.

THE SCARLET FEVER EPIDEMIC (1923-1924) IN BRÜNN AND RESULTS OF THE USE OF SERUM. JULIUS LANGER, München. med. Wchnschr. **72**:47, 1925.

In a scarlet fever epidemic, the use of serum obtained from patients from four to six weeks after scarlet fever proved of benefit, particularly in severe toxic cases.

LUMBAR PUNCTURE IN POLIOMYELITIS. S. WOLFF, München. med. Wchnschr. **72**:56, 1925.

The treatment of poliomyelitis with repeated lumbar puncture is recommended. This is done until the cerebrospinal fluid becomes normal.

AMBERG, Rochester, Minn.

THE NATURE OF AFEBRILE EXANTHEM IN INFANTS, WITH CLINICAL OBSERVATIONS. KAICHIRO IKEDA, J. Pediat., Tokyo **296**:1 (Jan.) 1925.

In Japan, the first report of afebrile exanthem (exanthema subitum) was made by Dr. Kozu in the *Japanese Journal of Pediatrics* in June, 1921; in the United States, the same disease was reported by Veeder and Hempelmann in December, 1921. All the former reports, however, were based on a limited number of cases. The author of this article has collected seventy cases of this disease which he personally saw in the Japanese Hospital in Dalny, Manchuria, between the years 1914 to 1923. In general, his conclusions are as follows: The disease attacks infants chiefly, and the younger children rarely. Infants between the ages of 1 to 7 months seem to be most susceptible, the 2 month old babies giving the highest percentage figure. The boys are attacked more frequently than the girls. The disease is most frequently seen in March, June and October, or the time when the season changes. The chief complaint of the infants affected with the disease consists of fever, general malaise, disturbed sleep, loss of appetite and diarrhea; occasionally cough and nasal discharge, vomiting and at times generalized convulsions. The examination reveals usually a slight pharyngitis and ocular conjunctivitis and sometimes bronchitis and otitis media. The characteristics of the objective findings is that they are mild in spite of high fever. The febrile period is usually between two and three days, the temperature falling in fractional manner and, with the fall of temperature, the patient feels well again. Otitis media is a frequent complication which may go on to suppuration, the percentage being 24. The eruption appears on the day the fever disappears or on the day following, lasting for two days. It is morbilliform in character but may be scarlatinal at times. It leaves no pigmentation nor causes any desquamation. The course of the disease is from five to six days. Urinalysis shows no abnormality. Prognosis is always good. Even after generalized convulsions, there is scarcely any danger of fatality. The disease comes on suddenly without any warning as a rule, but it may be preceded by premonitory

signs consisting of gastro-intestinal disturbances, cough, lacrimation and vomiting. The author frequently saw co-existence of febrile disease in one or more members of the patient's family. The examination of blood in this disease shows leukopenia, with relative decrease in polymorphonuclear neutrophils and relative increase in lymphocytes and decrease in eosinophils. The blood picture is identical with that found in influenza enteritis in infants. Bacteriologic examinations of pharyngeal secretion and of the sputum proved the presence of *Diplococcus pneumoniae,* and in from 14 to 16 per cent. of cases the presence of *Bacillus influenzae. Diplococcus pneumoniae* was also found in the purulent discharge from the middle ear and in 5.7 per cent. of stools. In view of the foregoing clinical evidences and bacteriologic findings, the author considers this disease to be an atypical form of infantile influenza.

KATO, Los Angeles.

Chronic Infections

QUANTITATIVE STUDIES IN SYPHILIS FROM A CLINICAL AND BIOLOGICAL POINT OF VIEW. XVI. LOCALIZATION AND FATE OF SULPHARSPHENAMIN IN THE VISCERA AND ITS PENETRATION INTO THE CENTRAL NERVOUS SYSTEM AFTER INTRAVENOUS ADMINISTRATION IN RATS. JOHN A. FORDYCE, ISADORE ROSEN and C. N. MYERS, Am. J. Syph. **9**:18, 1925.

A review is given of the clinical literature on sulpharsphenamin (sulpharsenol). The consensus of opinion is that this drug is as efficacious in producing cure and modifying serology as neo-arsphenamin given intravenously. On account of reactions and possible development of purpura, it must be used with care.

Animal experiments show that sulpharsphenamin is two and one-half times less active than neo-arsphenamin therapeutically.

The rate of deposition of sulpharsphenamin in the blood and viscera of rats is, in general, parallel with that of the other arsphenamins. There is no special affinity of sulpharsphenamin for the central nervous system. No superior clinical results were noted.

THE NEED FOR CAUTION IN THE DIAGNOSIS OF HUTCHINSON'S TEETH. IRWIN C. SUTTON, Am. J. Syph. **9**:94, 1925.

A case is reported of a secondary syphilid occurring in a girl who had received some treatment for congenital syphilis on the basis of notching of the incisor teeth. This, however, was not of the true Hutchinson type.

JUVENILE PARESIS. C. ROSENHECK, Am. J. Syph. **9**:96, 1925.

Juvenile paresis is considered by Rosenheck to be more common than generally supposed. A considerable number of cases are "formes frustes." The clinical picture is rarely as typical as in the adult. The absence of grandiose ideas, and early and progressive mental deterioration are features in which the juvenile differs from the adult form.

THE WASSERMANN TEST. VII. THE BLOOD SERUM OF PREGNANT WOMEN. DAVID L. BELDING, Am. J. Syph. **9**:132, 1925.

Fetal (cord) blood gives a lower percentage of positive reactions than maternal blood. About one third of the cord bloods of mothers with positive serums give a positive reaction. The positive cord blood usually results from placental

transmission of antibody and depends on a strong reaction in the mother. Occasionally it results from syphilis of the fetus.

The reaction of the cord blood is not a criterion of the future reaction in the child, since both negative and positive cord reactions may later become reversed. The serum of pregnant women is more unstable and more easily rendered anticomplementary by age, temperature, bacterial contamination, hemolysis and chemicals.

EFFECT OF VARYING METHODS AND PERIODS OF PRIMARY INCUBATION ON KOLMER'S QUANTITATIVE COMPLEMENT-FIXATION TEST FOR SYPHILIS. R. A. KILDUFFE and ROMAYNE THOMPSON, Am. J. Syph. **9**:149, 1925.

A period of incubation overnight (from 16 to 20 hours) in the icebox is more suitable than a shorter incubation. This gave a greater number of positive reactions and indicates quantitative gradations in their strength more definitely. Data as to specificity by such a technic have been given in other papers.

SUTHERLAND, Chicago.

SEVERE BLEEDING AND PURPURA FOLLOWING THE ADMINISTRATION OF NEO-ARSPHENAMIN. C. MORTON SMITH, Arch. Dermat. & Syph. **11**:237, 1925.

A case is reported in which, following the second injection of neo-arsphenamin, the patient had bleeding from the nose and gums and several purpuric spots appeared. These symptoms disappeared promptly. A third injection, one week after the second, was followed immediately by collapse, a sense of fulness in the head, cyanosis of the hands and great general weakness. Within two hours there was severe bleeding from the nose, gums, rectum and a needle puncture wound of the buttocks. Purpura appeared later. The bleeding continued for three or four days and the purpura was present for two weeks.

The discussion following this paper indicates that this complication is becoming less rare with the increased use of neo-arsphenamin and sulpharsphenamin and that it does not occur following arsphenamin.

JEANS, Iowa City.

TEN YEARS' WELSH TUBERCULOSIS DISPENSARY WORK. J. LEWIS THOMAS, Practitioner **114**:680 (Feb.) 1925.

This is a report on antituberculosis work performed in West Monmouth, comprising a population of some 200,000. There are nine visiting stations to which weekly visits were paid to four, fortnightly to three and monthly to two. In their examination, the proportion of positive cases has gradually declined from 30 to 23 per cent. Positive cases are divided into four classes, namely: the early, or sanatorium; the advanced, or hospital; the domiciliary, and finally, the dispensary cases.

The Pirquet test is done in every case, and in children this is performed in the supraspinous region. Records of 100,000 Pirquet tests in children in the years 1915 and 1916 lead the author to place a great deal of confidence on the reaction. In the nonpulmonary cases, children constituted the greatest number and these were mostly with glandular or joint involvement.

It has been the experience in this Dispensary that surgical treatment of enlarged tuberculous glands in the neck is most unsatisfactory.

GELSTON, San Francisco.

CONGENITAL SYPHILIS OF THE CRANIAL BONES. A. LOUSTE and L. LOUET, Bull. Soc. franç. de dermat. et syph. **31**:409, 1924.

In a man, aged 23, there had been recurrent epileptiform attacks of the jacksonian type for two years; there was a cranial hyperostosis in the right temporoparietal region. There were hutchinsonian teeth, and the Wassermann reaction was positive. The mother presented distinct signs of aortitis.

PARKHURST, Toledo, Ohio.

PARROT'S PSEUDOPARALYSIS. F. CANNARSA, Pediatria **32**:1432, 1925.

Cannarsa reviews sixty-five cases of osteochrondritis of the epiphysis causing a pseudoparalysis of one or more extremities in the first 2 months of life. Parrot's pseudoparalysis is a disease of infants in the first 3 months of life, being rarely seen after the third or fourth month. That the condition is localized in the epiphysis is explained by reason that this portion of bone in early life offers less resistance to the activity of the spirochetes. The lessened resistance of the epiphyseal zone is due to the rapid and intensive osteogenetic processes occurring in this zone.

In fifty-one of the cases reviewed, the condition occurred before the end of the second month; only eight cases after the third month and no case occurred later than the sixth month. Thirty-seven of the cases involved the right arm, thirty-five the left arm, eight the right leg, nine the left leg and in thirteen cases all extremities were involved. In two cases suppuration occurred and examination of the aspirated pus showed spirochetes. The Wassermann test was done in twenty-four cases, eighteen of which were positive and six were negative. Arsphenamin, or a preparation of bismuth or mercury protoiodin were used in the treatment of the cases reported; the best and most rapid improvement followed the intravenous administration of arsphenamin while the least improvement was noted in those cases treated with bismuth. Cannarsa does not say whether the six infants in whom the Wassermann tests were negative showed other signs of syphilis or whether the diagnosis was confirmed in these cases by roentgen-ray examination.

SERO-DIAGNOSIS OF TUBERCULOSIS. L. BONACORSI, Pediatria **32**:1443, 1925.

Bonacorsi tested the serum of tuberculous children for flocculation reactions. He used cholesterolized alcoholic extract from tubercle bacilli as antigen. In 128 known cases of tuberculosis, the test was positive in all but two and negative in all the controls except one. In two patients with miliary tuberculosis, both of whom showed a negative skin tuberculin test, the reaction was positive. The reaction was also positive in six cases of tuberculous meningitis in which the spinal fluid did not show the tubercle bacilli, the skin tests were negative but the diagnosis was confirmed at necropsy. Bonacorsi concludes that the flocculation reaction is much more sensitive and reliable than either the Pirquet or Mantoux tests.

DE SANCTIS, New York.

RADIOLOGIC DIAGNOSIS OF PRIMARY PULMONARY TUBERCULOSIS. F. SKALNIK, Casop. lek. cesk. **63**:937 (June 21) 1924.

A group of 1,103 children under 14 years of age were examined by roentgenogram, fluoroscope and orthodiagram of the hilum of the lungs. The pathology is divided into the primary lesion of the lung, the lesion of the hilum lymphatics and a combination of both. The roentgenographic diagnosis of the primary lesion depends on its calcification essentially. The characteristic lesion is

fairly distinct in outline, usually near the surface and varies in size from a pinhead to a chestnut. No location can be regarded as diagnostic. Early lesions show a pneumonic center with peripheral inflammatory reaction. The center quickly calcifies and the inflammatory reaction subsides. Pathologic anatomy is able to detect 93 per cent., while roentgenology detected only 5.6 per cent. of primary lesions in a survey at a sanatorium. This is due essentially to overlapping with the heart, rib, diaphragm and other shadows, but may be due to variations in ray intensity. In attempting a diagnosis on the basis of peribronchial gland enlargement, the effect of such previous diseases as pertussis and measles must be taken into consideration.

STULIK, Chicago.

TUBERCULOSIS OF THE MIDDLE EAR AND OF THE LARYNX IN CHILDREN. FUJIRO NAKAHACJI, J. Pediat., Tokyo **296**:75 (Jan.) 1925.

The author emphasizes the fact that the early diagnosis of tuberculous otitis media and tuberculous laryngitis is of clinical importance, and that the examination of the necrotic material from the middle ear of debilitated children usually reveals the presence of tubercle bacilli. This can best be done by carefully cleansing the external auditory canal, and after the lapse of at least six hours examining the smears of the mucocaseous material in the secretion of the middle ear. The microscopic demonstration of the tubercle bacilli is likewise readily accomplished by a similar test from the caseous material of the ulcerative tuberculous lesions of the larynx.

KATO, Los Angeles.

INCIDENCE OF TUBERCULOUS INFECTION IN CHINA. JOHN H. KORNS, China M. J. **39**:10 (Jan.) 1925.

Tuberculin tests (Pirquet method) were made on 2,049 apparently healthy Chinese, between the ages of 8 and 20 years. The percentage of positives for those older is only very slightly higher than for those younger, there being no gradual increase with increase in years. The percentage of positives is practically the same for those classed as urban and those classed as rural. In ninety-seven hospital patients under 8 years, 26 per cent. were positive and 60 per cent. of these gave clinical evidence of tuberculosis. The result may indicate that the incidence of tuberculosis in the Chinese race is not so high as has been supposed.

PILCHER, Cleveland.

Internal Diseases

REPORT OF A FATAL CASE OF DIABETIC COMA WITH INSIGNIFICANT KETONURIA, AND WITH A LARGE AMOUNT OF ACETONE IN THE SPINAL FLUID. HENRY M. FEINBLATT, Arch. Int. Med. **34**:508 (Oct.) 1924.

In the unusual case of diabetes reported here, the disease ran its course in three weeks. The patient was a girl, aged 9. Profound coma developed about three days before death. In spite of treatment by lavage, sodium bicarbonate, and administration of 110 units of insulin within twelve hours, the patient showed no response to the medication. As indicated by the title, the striking feature of the case was the absence of acetone in the blood, the presence of only a trace of acetone, and no diacetic acid in the urine, while the spinal fluid gave evidence of a very large amount of acetone.

VONDERÄHE, Cincinnati.

THE USE OF IODIN IN EXOPHTHALMIC GOITER. WALTER M. BOOTHBY, Endocrinology **8**:727, 1924.

The author gives a short history of the use of iodin in the treatment of goiter. He recites several case histories from the Mayo Clinic, showing what type of cases respond to iodin. The conclusions are: 1. Iodin administered to patients with adenomatous goiter without hyperthyroidism often initiates a syndrome comprehended in the term adenomatous goiter with hyperthyroidism. 2. Iodin administered to patients with exophthalmic goiter usually reduces the basal metabolic rate, and practically always causes the typical and characteristic nervous and gastro-intestinal symptoms to disappear. 3. Iodin when properly administered, will prevent death from the acute postoperative exophthalmic goiter crisis. 4. Iodin, with few exceptions, should be advised only as a temporary therapeutic measure, in the treatment of exophthalmic goiter, to make the patient's condition safe for partial thyroidectomy.

ROYSTER, University, Va.

LARVAE OF THE CHERRY FRUIT FLY, RHAGOLETIS CINGULATA, AS A PSEUDOPARASITE. M. W. LYON, JR., J. A. M. A. **84**:1041 (April 4) 1925.

The larvae, which were found in the stools of a boy, aged 22 months, caused no symptoms.

BONAR, Salt Lake City.

THE TREATMENT OF PURPURA HEMORRHAGICA BY SPLENECTOMY. G. A. SUTHERLAND and BRUCE WILLIAMSON, Lancet **1**:323 (Feb. 14) 1925.

The authors consider only that form of purpura which has been termed "Essential Thrombocytopenic Purpura Hemorrhagica" by American writers. This form occurs commonly between the ages of 2 and 15 years, and appears to be a primary disease. There is no hereditary tendency and there is no known constitutional or local disease associated with it.

Many patients acutely ill tend to recover naturally with, without or in spite of treatment.

Attention in this article is confined to patients who chronically relapse, who are the only ones in which treatment by splenectomy would be considered.

The usual history is one of fresh hemorrhages recurring from time to time, and lasting for a few days or weeks. The hemorrhage is usually epistaxis, though oozing about the gums, hemorrhage of the stomach, bowel, kidneys and urinary passages, vagina and sometimes of the brain and meninges may occur.

The onset and progress of the disease are characterized by a singular absence of symptoms of discomfort or of ill health. Only the progressive anemia finally leads to symptoms. The petechiae are usually small and discrete and remain so. They are most abundant in the lower extremities. The spleen is enlarged but usually does not attain any great dimensions.

The characteristics about the blood are: (1) A great diminution in the number of blood platelets (from 5,000 to 40,000); (2) prolongation of the bleeding time (average time from 10 to 12 minutes); (3) nonretraction of the blood clot.

The authors suggest that splenectomy be done during a free interval, and that the patient has at least one month's rest in bed before the operation.

The histories of three cases of purpura hemorrhagica are given in full. The first patient, a girl, aged 8 years, had had nine admissions to hospitals,

several of them for serious hemorrhage with collapse. The blood showed all the special characteristics of purpura hemorrhagica. Splenectomy was done, the spleen being two and one-half times the normal weight. Five months after operation the child showed remarkable improvement; she now leads an ordinary active life. No external hemorrhage has occurred though petechiae and bruises still occur but not so frequently. The blood condition has improved progressively.

The second patient was a boy, aged 9 years, who was under observation for seven months before splenectomy was done. During this time he showed petechiae and ecchymoses frequently, and on numerous occasions developed epistaxis, hematemesis and melena. The blood showed all the characteristics of purpura hemorrhagica and the spleen was moderately enlarged. On rest in bed there was a gradual improvement. At operation the spleen was found to be three times the normal size and on microscopic examination showed a picture almost identical with that of the first case, namely, great diminution in the number of lymphocytes and marked endothelial proliferation in the malpighian bodies and sinuses. Convalescence was interrupted by an attack of acute appendicitis which was treated by operation. Five months after splenectomy the boy was found to be in excellent health, no hemorrhage in any form having occurred since the operation.

The third patient, a girl, aged 13 years, gave a history of a tendency to bruise easily since the age of 4 years, also frequent profuse epistaxis with hematemesis on one occasion only and no occurrence of melena or hematuria. For over eight years petechiae in the skin and mucous membranes and larger subcutaneous extravasations were remarkably constant features. For the last two years there had been a decided improvement as regards the frequency and the severity of the hemorrhages. In the main, the blood picture and tests conform to purpura hemorrhagica; however, a good clot retraction was noted each time and the bleeding time averaged from six to ten minutes. In this case: "The future appears to hold the promise of complete recovery unaided by any active treatment."

LANGMAN, New York.

NEW OBSERVATIONS ON INFANTILE CARDIOMEGALIC ANEMIA. E. MENSI, La Clin. Pediat. **1**:48, 1925.

The author adds further studies to his preliminary report on this condition made in the April, 1922, issue of *La Clinica Pediatria*.

This syndrome, characterized by anemia and cardiac enlargement, was first described by Heubner, and was called infantile cardiomegalic anemia by Mensi.

In reviewing the literature, the author found only eight reported cases: four by Heubner; two by Hauser; one by Parodi, and one by himself.

He makes the following observations in his present treatise:

1. The existence in infants of the Heubner syndrome is definitely established by clinical and anatomic findings.

2. The anemia differs in each case and it may resemble any of the known clinical types.

3. The etiology and pathogenesis of the anemia is obscure. All of known causative agents were carefully excluded in all the observed cases. Among these are: syphilis, tuberculosis, malaria, leishmaniasis, hookworm disease, dibothriocephalic anemia and nutritional disorders.

4. The cardiomegaly is represented by a conspicuous volume increase and by a pronounced hypertrophy of the heart.

5. Every mechanical, congenital and valvular defect was excluded in each case as a cause of the cardiac enlargement. The author is inclined to assign it to the idiopathic category.

6. None of the patients presented sufficient evidence to classify the condition in the group of congenital diseases.

The following case was reported:

A. C., a girl, aged 2 years, was born at full term and of normal delivery. Her past history was unimportant. The patient had been ill for four months; the mother reports that the infant has had intestinal disorder, marked pallor and abdominal distention. The patient was fairly nourished; the adipose and muscular tissues were sparsely developed. The skin was cold and clammy and presented a waxen pallor with a slight icteroid tint. There was no adenopathy and the lungs were normal.

The heart was enlarged to the right beyond the midsternal line and to the left beyond the mid-mammary line. There was a soft, blowing, systolic murmur diffused over the entire precordial area. It showed no definite transmission. The second sound was accentuated. The abdomen was enlarged. There were no meteorism and no ascites and marked tympany was present. The liver and spleen were normal.

Roentgen-ray measurements of the heart were: Diameter at base, 9 cm.; longitudinal diameter, 10 cm.; transverse diameter, 10.5 cm.

Blood examination showed hemoglobin, 30; red cells, 2,100,000; white cells, 6,500; color index, 0.71. Stained smears showed slight anisocytosis, no poikilocytosis and an occasional normoblast.

Examination of the urine and feces was negative. The blood Wassermann test was negative. During observation, there was no hyperpyrexia, the respiratory rate was normal with occasional dyspnea; the pulse rate averaged 96. A careful differential diagnosis was also made.

Mensi concludes by saying that the syndrome may be the expression of some tissue alteration which occurs during the embryologic period. Nevertheless, the condition, as it exists at present, is an enigma and is worthy of further investigation.

ZAMBARANO, Washington, D. C.

ACUTE NEPHRITIS IN CHILDREN. R. S. ALLISON, Practitioner **114**:681 (March) 1925.

This is a report of twelve cases of acute nephritis observed at the West London Hospital during the past year.

Examination consisted of the routine chemical and microscopic investigation; urea concentration test; blood urea and the diastase content of the urine.

Regarding the family history, in only two cases was there a history of nephritis. Regarding the etiology, ten of the twelve patients had had no illnesses within the last two years. One of the remaining patients had a history of scarlet fever followed by diphtheria. The other was a weak, rachitic child who had suffered from any attacks of tonsillitis. In eight of the cases, there was evidence of enlarged tonsils in a condition of subacute inflammation. Of the remaining four, one had a catarrhal otitis media, one a bilateral suppurative otitis, and two showed no focus of infection whatsoever.

These facts are of interest considering the teaching that in children, acute nephritis has two main causes, namely: scarlet fever, cold and exposure. Recent writers, of course, have placed much more emphasis on infection of the tonsils and adenoids.

In all twelve cases, the onset was insidious. The average duration of symptoms before examination was one month. The following symptoms were noted; (1) lassitude, anorexia, and headache in all twelve patients; (2) pallor, facial, in six; (3) puffiness due to edema under the eyes in five; (4) vague abdominal pains in three; (5) earache in five; (6) blood in urine in five; (7) vomiting in four and (8) epistaxis with joint pains and purpura in one case. From a clinical standpoint, there appears to be no definite relationship between the severity of the symptoms, condition of the urine and the biochemical findings.

Treatment consisted of rest in bed until the urine had been albumin-free for at least four days. From 40 to 50 ounces of fluid were allowed during the twenty-four hours. During the first week, there was a rigid milk diet. Throughout, salt was excluded. Two grams of protein per kilogram of body weight was allowed in acute stages. During the acute stage a mixture containing 5 minims of tincture of hyoscyamus and 5 grains of potassium citrate were administered three times a day.

The most important part of the treatment was the removal of the focus of infection, namely, the tonsils and adenoids, and this was carried out even if the urine did not become free from albumin.

All patients observed in the outpatient department after a subsequent period of nine months have been perfectly well, their average period of hospital care having been one month. From the observation of this series of cases, the following conclusions have been drawn:

1. Two thirds of the patients, at the time of the onset of the acute illness, showed markedly enlarged tonsils and adenoids which were in a state of chronic inflammation. From the results of their removal, it can hardly be doubted that these were the etiologic factors.

2. Clinically, half of the patients showed massive hematuria, severe constitutional disturbance and slight edema. "Smoky" and dark concentrated urine was associated with less severe constitutional symptoms. Oliguria was not a feature in any of the cases.

3. The functional tests for renal efficiency were of no prognostic or diagnostic value. The blood urea was raised in one third of the cases, the rise being temporary, and returning to normal with subsidence of the acute symptoms.

4. The large majority of the patients were free from symptoms, and had apparently recovered within a month from the onset. No case of uremia or a fatal termination was met with.

4. At periods ranging from nine months to 1 year after, the children were reexamined and found to be healthy and to show no trace of disease.

GELSTON, San Francisco.

THE WEIGHT OF DIABETIC CHILDREN TREATED WITH INSULIN. D. P. NOBECOURT, Arch. de méd. d. enf. **28**:23 (Jan.) 1925.

During the course of insulin treatment, the increases in weight of three diabetic children showed particular characteristics. In one the augmentation continued regularly during the intervals of treatment as well as during the periods in which the insulin was given. In another the increase was regular and pronounced. In the third the weight gain was irregular and was interrupted by considerable losses. From these observations the author is of the

opinion that the variations in weight which occur in different varieties of serious diabetes of children, regardless of the food intake, may be attributed to some variation in the water metabolism.

BONAR, Salt Lake City.

TWO CASES OF HEMOLYTIC ANEMIA. OSCAR HERZ, Monatschr. f. Kinderh. **29**:224, 1924.

The writer gives reports of two cases of hemolytic anemia, one in a child of 4 years, the other in an infant of 6 weeks. In both of these, the parents had suffered with blood diseases, and in the case of the infant the mother had undergone a splenectomy six years before.

The prognosis is good in children and the writer warns against splenectomy.

BLOOD TRANSFUSION IN NURSLINGS. LEON PERIC, Monatschr. f. Kinderh. **29**:230, 1924.

Blood transfusions are commonly supposed to supply simply substitute blood to the patient. Peric reports five patients in whom the improvement kept up for some time, the blood findings being better at the end of two weeks than immediately after the transfusion. He concludes that the injection of blood not only supplies blood to the patient but also acts as a stimulant to the blood making organs.

In the case of a premature infant this stimulating effect was not observed.

GERSTLEY, Chicago.

INTRADERMAL INJECTION OF INSULIN. E. F. MUELLER, München. med. Wchnschr. **71**:813, 1924.

Insulin injected intradermally in rabbits reduces the blood sugar for a somewhat longer period of time than when injected subcutaneously. It is stated that delayed resorption cannot account for these phenomena.

GOITER PROPHYLAXIS IN SWITZERLAND. H. EGGENBERGER, München. med. Wchnschr. **71**:972, 1924.

This interesting paper deals with the results of iodin prophylaxis of goiter in a region of Switzerland. Two conclusions are cited here. The examination of school children showed that after the first year the thyroid glands diminished in size. This was noted in children entering the first grade. Prophylaxis must begin in the preschool age. The effect of properly exercised prophylaxis shows best in the new-born. Some women use iodized salt, some do not. None of the offspring of the users of iodized salt showed palpable increase of the thyroid gland, while 50 per cent. of the others did as in former years. Five-tenths gram of potassium iodid to 100 gm. sodium chlorid is sufficient.

THE DISTURBANCE OF CYSTIN METABOLISM. G. O. E. LIGNAC, München. med. Wchnschr. **71**:1016, 1924.

At the postmortem examination of two boys, aged respectively 3 and 2 years, both physically underdeveloped, one since birth, extended crystalline cystin deposits were found in different organs. Both children died with progressive atrophy, in one case associated with disturbances of the sugar metabolism, in the other with severe infections.

THE RELATIONSHIP OF POLYCHROMASIA TO INFANTILE ANEMIA AND TRANSFUSION. J. OCKEL, München. med. Wchnschr. **71**:1356, 1924.

The number of polychromatic erythrocytes increases during the second month of life. The increase is rapid during infancy and then decreases gradually. In the new-born the number is about the same as in the adult.

THE EARLY USE OF THE BOUGIE ACCORDING TO SALZER IN LYE EROSION OF THE ESOPHAGUS IN CHILDREN. J. VON BOKAY, Ztschr. f. Hals-, Nasen-u. Ohrenh. **9**:534 (Jan. 20) 1925.

The deep rooted principle existed of waiting until the fourth or eighth week before using the bougie after the cicatrization of the ulcer had taken place. Therefore, no attention has been paid to the prevention of the stricture. In 1920, Salzer, after observing twelve grave cases, very warmly recommended that the systematic use of big bougies should be started on the second to the sixth day, because by this early treatment, in each case, the formation of a cicatricial stricture had been prevented. Salzer used the thick No. 30, black caoutchouc bougies of Bass, which are filled with grains of shot. On account of their weight, they enter the esophagus almost by themselves if they are first put in warm water. Salzer left the bougies in place for one-half hour, and used them every day in the beginning, later only every second day and at last only once a week. The early use of the bougie in children is suffered without trouble, and Salzer emphasizes that it is much more gentle than the treatment of the stricture and that it is scarcely ever accompanied by pain. The children can be well nourished from the beginning, which is a great advantage. In 1924, Salzer reported fifty-six cases and came to the conclusion that it was our duty to start the early treatment. Bokay treated 147 patients from March 3, 1920, to May, 1924. In light cases the treatment was started on the second, in grave cases on the sixth day. Bokay also used bougies Nos. 31 and 32. The first time the bougie was left in the esophagus for only five to ten minutes, otherwise usually for one-half hour. Sometimes in smaller children, when the saliva cannot be expelled, the bougie had to be removed for a short while, and then had to be reintroduced. Bokay never saw a hemorrhage from the use of the bougie. The bougie was introduced daily for three or four weeks, then only every second day, and after three or four weeks only twice a week, and at last only once a week. In cases in which spasm of the esophagus was present, a papaverin-procain-anesthesin solution was used one-half hour before the treatment. Of the 148 patients 70 per cent. were under 3 years of age. Of these, five were less than 1 year old. As a rule, the patients were cured without formation of a stricture, with the exception of those cases in which the treatment was interrupted on account of the neglect of the parents, or on account of intercurrent diseases. Eighty-seven and eighty-four hundredths per cent. were cured without stricture. In one single case a stricture occurred in spite of early and systematic treatment, but still bougie No. 30 could be passed. Even a short interruption of treatment was harmful. Eight patients died. In only two of these, a perforation was caused by the bougie. Two others showed a rupture of the esophagus after use of the bougie, but there was no direct perforation.

In one patient, several perforations of the stomach were found but these were not in connection with the use of the bougie. One patient died of sepsis caused by the erosion of the oral mucous membrane and another died of pneumonia. In one instance the child died at home; the cause of death could not be determined, as necropsy was not permitted. In this case a perforation in consequence of the treatment cannot be excluded. If Bokay assumes a perfora-

tion in this case, then three perforations occurred in 148 cases, namely, 2 per cent. If the two cases of indirect rupture of the esophagus were added to the few cases of undoubted perforation, and to the one case of possible direct perforation the percentage was 3.3.

AMBERG, Detroit.

Nervous Diseases

PROBLEMS OF THE PERSONALITY OF SCHOOL CHILDREN AND THE RESPONSIBILITY OF THE COMMUNITY FOR DEALING WITH THEM. C. MACFIE CAMPBELL, Am. J. Psychiat. **4**:471, 1925.

The investigation of the disorders and difficulties of childhood is an important field of work, for which special training is required. More real value is to be anticipated from deliberate procedure with the help of a well trained personnel than by covering a wide field superficially.

Yet there are interesting possibilities as to an extensive survey of this field, illustrated by what has been done in Massachusetts. Units have been formed to act as clinics for children retarded in school work. A unit comprises a psychiatrist, a psychologist, a psychiatric worker, the school physician, a school nurse and a teacher. Campbell suggests that such a team might also be used for getting in touch with another group of children — the nervous or unstable, and those who have some sort of personal difficulty. This group is important because these children are candidates for nervous trouble later, and this is the time for prophylactic treatment. Moreover, these children may have a bad influence on others, especially from the standpoint of sex hygiene.

From studies of a few cases taken at random, some idea of the extent of the social problem may be gained; the teacher becomes more enlightened in these matters; from interviews with parents the gap between home and school training may be bridged better, with the outlook of a less precarious future for these children.

REEDUCATION OF A PSYCHONEUROTIC GIRL. JESSIE TAFT, Am. J. Psychiat. **4**:477, 1925.

This is the detailed history of a particular case, designed to show: "the complexity and subtility of material with which the child-placing agency works, the contribution it may make to our knowlege of human behavior, and its need for all of the understanding which psychiatry can bring to bear."

SOME EMOTIONAL PROBLEMS SEEN IN THE SUPERIOR CHILD. MARION E. KENWORTHY, Am. J. Psychiat. **4**:489, 1925.

Too often there is a tendency for the parents of a child of superior intelligence to emphasize and stimulate the intellectual side of his nature at the expense of his physical and his emotional sides. The consequence is damage to "the continuous progressive organization of his personality as a whole."

The child learns to gratify his ego in the parental plaudits of his intellectual accomplishments rather than in the tasks and sports of his age; hence he is too often unable to meet the physical demands of everyday existence in school and in play. As he learns of his physical and social inadequacies, there is the natural tendency to turn more and more toward scholastic achievement for satisfaction, with an ever widening gap between himself and his fellows. As an offset against his own sense of deficiency in other lines, he will be prone to develop a disdain for intellectual mediocrity in others; he will become

seclusive, and his emotional reactions may presently become so painful as to interfere with success in his one field, scholastic achievement. Eventually, when his powers should have reached full flower, he will be regarded as peculiar or queer, or perhaps even unbalanced mentally.

CHILDHOOD INADEQUACY IN RELATION TO INTERNAL GLANDULAR SYSTEM. WALTER TIMME, Am. J. Psychiat. **4**:499, 1925.

A large group of infants is characterized by hypoplasia of important structures, the vascular system, suprarenals, pituitary, thyroid and gonads, with large lymphoid organs. These children have certain inadequacies due to structure, to biochemical changes and to glandular insufficiency, which even in later life can be recognized. There is a tendency for the condition to be compensated spontaneously by over activity of the endocrines which leads to bodily changes. Timme calculates that there are some 720 combinations of inadequacies, all depending on the primary hypoplastic condition. Some of these inadequacies may be intellectual, emotional or behavioristic. These are the patients who are referred to the psychiatrist or to the psychologist. Some of these children may go on to dementia praecox; it is impossible to classify which.

RESISTANT BEHAVIOR OF CHILDREN. DAVID M. LEVY, Am. J. Psychiat. **4**:503, 1925.

Workers of the Illinois Institute for Juvenile Research have attempted to standardize the resistant behavior of infants and children during examination. Ranging in age from 6 to 60 months, 983 children were studied in groups. Conditions were standardized so far as possible by certain routine tests for all groups. Complete or partially resistant behavior or complete cooperation was noted with the child on the mother's lap, when put on the floor or when put on a table.

Graphically expressed, there is a rise in resistance from a low level at 6 months to a peak at the period of from 30 to 35 months; then there is a gradual fall of the curve to a low level of 54 months. A lower peak precedes the high one at about 18 months. Resistance among females occurs earlier, rises higher and lasts longer than among males. Age resistance patterns also vary, starting with simple crying, passing through active resistance, and ending with passive uncooperation. These resistances are "proof of an innate behavior pattern, showing characteristic differences for sex and age periods throughout infancy and childhood."

LYON, Boston.

THE OCCURRENCE OF MONGOLISM IN ETHIOPIANS. ADRIEN BLEYER, J. A. M. A. **84**:1041 (April 4) 1925.

The author reports two cases of mongolism in negro babies, aged 5 and 21 months respectively. In a third case, the existence of remote white parentage was acknowledged. The usual serologic tests were negative.

BONAR, Salt Lake City.

CISTERN PUNCTURES. JULIUS JANOSSY, Med. Klin. **21**:55, 1925.

Puncture of the cistern is not difficult, the method employed by the author being as follows: The head of the patient is bent forward slightly, thereby stretching the atlanto-occipitalis membrane. Then the occipital protuberance is

palpated, as also the spinous process of the second cervical vetebra. At the edge of the under third of the distance between these two points, the skin is perforated exactly in the midline. The line which joins the point of puncture with the upper edge of the root of the nose points the direction of the needle. When one proceeds in this direction, the neck musculature is reached at the atlanto-occipitalis membrane, which is 4 cm. in thickness and a distinct hindrance. The membrane is cautiously perforated, whereupon fluid promptly appears if the patient is lying down. If he is sitting up, there is negative pressure in the cistern, and fluid appears only on suction.

The foregoing method is similar to that employed by Wegeforth, Ayer and Essick, but differs from that of Eskuchen. At first, the author used the Eskuchen method, as the American method seemed difficult. The American method is quicker, yet it requires more practice. Eskuchen's method is slower, but gives the operator a feeling of safety. To obtain the necessary experience and practice, it is important to try the puncture on cadavers, although it is much easier to perform on a living being.

Irreparable damage may be done by using incorrect methods. A lumbar puncture needle to which a syringe may be attached is best. It is advisable to use a needle with an accessory branch which may be closed.

Injury to the oblongata may be avoided by observing the following rules:

1. Puncture must be made exactly in the midline, and the needle must go in straight.

2. The head must be exactly in the middle position and remain so throughout the execution of the puncture.

3. The needle should not go in deeper than 6 cm. In the four cases of injury to the oblongata reported in the world literature, the needle went in more than 6 cm.

4. The patient should be in a lateral position. In the lying patient, fluid comes spontaneously on perforation of the atlanto-occipitalis membrane, and appearance of the fluid is warning not to go farther.

5. After perforation of the membrane, the needle should not go in more than 0.5 cm.

6. Injury to a cerebral vessel may cause life-long damage to the patient. Fortunately, there are not many vessels in this area. Several cases in which hemorrhage occurred are cited.

7. Fluid should be drawn slowly, especially when there is dislocation of the cistern due to tumor, abscess, etc., and if the tumor or abscess is not definitely localized, it is advisable not to draw off more than from 1 to 2 cm. of fluid.

A cistern puncture does not cause as much distress to the patient as does a lumbar puncture. Furthermore, it is not necessary for the patient to remain in bed following a cistern puncture; in fact, it is advisable for him to remain up.

The technic of the cistern puncture is easier than that of the lumbar puncture. The double puncture may be a valuable aid in the diagnosis of diseases of the spinal cord. If the lumbar canal is not obstructed by a tumor, the same kind of fluid is obtained from both punctures. In case there is an obstruction, the spinal fluid may differ from the cisternal fluid in its albumin content, refraction, color, etc. There may also be differences in pressure. If a neutral staining solution is injected into the cistern, it appears spotted in the lumbar sac or does not appear at all. For this purpose, various highly diluted neutral staining solutions may be used, such as methylin blue and phenolsulphonethalein. The author has

used blood diluted with fluid, having first convinced himself that the spinal fluid did not contain any blood.

The author mentions Sicard's experiments with an iodized vegetable oil to determine obstruction in the spinal canal. Wartenberg has used other iodin preparations on dogs.

A case of spondylitis of the seventh dorsal vertebra is cited in which 0.75 c.c. of iothion was injected into the cistern following the puncture. The patient immediately grew very pale, was covered with cold perspiration, became dizzy, with rapid, weak pulse, and weak and slow respiration. Camphor and caffein were given subcutaneously, and in twenty minutes the patient began to improve. The roentgen ray showed an intensive shadow at the level of the seventh dorsal vertebra caused by accumulated drops of iothin. Incontinence and complete paraplegia followed, and only after ten days did the patient begin to improve, and did not completely recover for six weeks.

The author states that theoretically one might expect important differences between cistern and spinal fluid findings in meningitis — that the fluid coming direct from the brain would be richer in leukocytes. Experiments have shown, however, that this is not true, and that in most cases there were more leukocytes in the spinal fluid.

Some authorities recommend cistern punctures for the relief of pressure, and undoubtedly patients endure under daily cistern punctures better than they do under lumbar punctures. The lumbar wash recommended by Podmaniczky in the treatment of meningitis could be made easier and more effective through the cistern.

Wegeforth, Ayer and Essick have employed the intracisternal serum method in acute meningitis, reporting one cure. Nonne reports one cure and Hartwich two by this method. In five patients, the author has used caffein diluted with 20 per cent. liquid solution, each time from 0.2 to 0.3 gm. Circulation remained the same; respiration became deeper and resembled the Kussmaul respiration.

An outstandingly interesting case was one of pernicious anemia that responded to the foregoing treatment. Lobelin obtained good results with the foregoing method, in a case of acute morphine poisoning, and in this instance saved the patient's life.

The author has also used strychnin, epinephrin and atropin intracisternally, but it is as yet too early to have come to any definite conclusions regarding their value. Mention is merely made here that intracisternal medication may be employed in cases of poisoning, for example morphin, in beginning paralysis of the oblongata following lumbar anesthesia or narcosis and where there is a threatened paralysis of the respiratory centers.

In summary it may be said that the cistern puncture, performed with the necessary precautions, is no more dangerous than the lumbar puncture; the technic is easier, and it is also an improvement over the lumbar puncture from a diagnostic and therapeutic standpoint.

MOERSCH, Rochester, Minn.

FOOT PHENOMENON IN MENINGITIS. C. NIZZOLI, Pediatria **32**:1269, 1925.

C. Nizzoli found the phenomenon (described by A. Nizzoli in 1919) constantly in meningitis. The patient lies on his back with extended lower extremities. Flexion of one leg in the knee and hip-joint causes a dorsal flexion of the great toe on the other extended leg. He regards this sign as a valuable aid in the diagnosis of meningitis.

DE SANCTIS, New York.

A Case of Nervous Polydypsia. Sukeuemon Nishimura, J. Pediat., Tokyo **296**:137 (Jan.) 1925.

The author reports the case of a boy, aged 3 years and 7 months, who was admitted to the University Hospital on the tentative diagnosis of diabetes insipidus, with the history that for about one month previous to admission the child would take on an average six liters of liquid daily, and would urinate four or five times an hour. About four months before admission, the child became very fond of salty food and nothing else was ever enjoyed. There was nothing of significance in the family history, and the only former illness was that of Heine-Medin disease at about 3 months of age; at the age of 2 years and 8 months the child began to walk for the first time, but there was still some motor disturbance with muscular atrophy of the right lower extremity. Examination revealed a fairly well-nourished boy, 87.7 cm. tall, weighing 11.2 kg., with pale face, dry mucous membrane, no demonstrable deformities anywhere, slightly hypertrophied tonsils and normal sella turcica. The heart sound was normal, the pulse was somewhat slow but there were no irregularities, the rate being 100 per minute. Systolic blood pressure was 95, diastolic 65. The lungs were normal. The liver was palpable at two fingers' breadth below the costal margin in the right nipple line. The spleen was not palpated. The right lower leg was partially paralyzed with muscular atrophy. The patellar reflexes were absent. The genitalia were normal. Dermographia and Aschner's phenomenon were both negative. The Pirquet and blood Wassermann tests were both negative. The intake in the hospital was not restricted at first but the amount of both intake and output gradually decreased in about two weeks. The specific gravity of the urine on admission was from 1.001 : 1.004 but gradually ascended to 1.012 : 1.016. The urine reaction was always weakly acid and albumin, acetone and indican were never seen. The ingestion of sodium chlorid by mouth in doses of from 6 to 10 gm. had no effect on the urine. A hypodermic injection of 0.3 c.c. of pituitary extract was without effect. From these tests, the author concludes that the condition is not that of diabetes insipidus, in which pituitary extract and increased ingestion of salt have a marked effect on the concentration of the urine, but that of simple polydypsia having a nervous origin.

Kato, Los Angeles.

Epidemic Outbreak in Japan of an Unidentified Disease Involving the Central Nervous System. China M. J. **39**:1 (Jan.) 1925.

The disease was first considered to be cerebrospinal meningitis, later encephalitis lethargica (epidemic encephalitis), but finally as a disease of the central nervous system undescribed hitherto. The epidemic was first noted in July, 1924, and by September 29, 6,551 cases had been reported. The incidence in one province was nearly 3 per 1,000. The mortality was 54.85 per cent. The occurrence of more than one case in a family was very rare. The decline of the epidemic was rapid and happened to coincide with the coming of the rainy season, after an unusually dry summer. The incidence was but 1 per 10,000 below 10 years, increasing to a maximum of 20.7 per 10,000 in those over 80 years. The onset was sudden, with high temperature, after one or two days, loss of consciousness and a slightly maniacal condition. Death occurred in from five to ten days, or recovery with the falling of the temperature which is accompanied by a regaining of consciousness. Cerebrospinal

fluid in all cases was clear; the pressure was not uniform. The cell count was from 10 to 40. No pathogenic micro-organism was found.

PILCHER, Cleveland.

Diseases of the Eye

BLINDNESS FROM TEETH, TONSILS AND ACCESSORY SINUSES. LEON E. WHITE, Boston M. & S. J. **192**:64 (Jan. 8) 1924.

White, reviewing the subject, mentions the anatomic relationships, gives ten references to his own published work and eleven other references.

The author states that over half of the patients give a history of a recent coryza or influenza but that in a few there is no history of infection. Whenever the sinuses are negative, both teeth and tonsils should be suspected. Tonsils at all suspicious, with teeth and sinuses negative, should be removed. He feels that diagnosis many times must be made largely by exclusion. In all cases the patient should undergo thorough physical and neurologic examination. While investigating, time is an important element and it is essential that needless delay is not encountered.

Pituitary disease, brain tumor and multiple sclerosis, while not usually producing such sudden loss of vision, must always be borne in mind.

White speaks of removing the tonsils and opening the posterior sinuses in two patients during the last year, only after they had been thoroughly investigated at the Peter Bent Brigham Hospital and had been discharged from that hospital on the assumption that there was no intracranial condition to account for the loss of vision. These, while not typical cases of accessory sinus blindness, showed sufficient pathologic changes in the nose and throat to warrant making an attempt to benefit their vision by this procedure. They were not benefited and both have since been operated on for tumors above the sella turcica. He says that careful investigation should prevent unnecessary operating.

In reflecting on the pathology of the subject, he considers the following possibilities:

1. Direct extension from the infections in the posterior sinuses to the optic nerve.

2. Toxemia from some infective process. Knowing that retrobulbar and optic neuritis can be caused by alcohol, lead, tobacco, quinin, ethylhydrocuprein, arsenic, syphilis, etc., so that reasoning by analogy there is little doubt but that toxins originating in the accessory nasal sinuses, teeth or tonsils or any part of the body, may have similar action on the optic nerve.

3. Under the heading of bacteremia, Billings has shown that infectious micro-organisms may be carried in the blood stream or by the lymph channels from the foci of infection to the blood vessels in various regions of the body. So there seems little doubt that bacteria may also travel by the lymph channels to the optic nerve.

4. Under the heading of hyperplasia, White feels this is probably of considerable importance and that it undoubtedly renders the accessory sinuses more vulnerable. He feels hyperplasia with infection and direct extension to the optic nerve is probably of far greater consequence than the mere fact that the tissue has become hyperplastic.

5. Under the subject of anaphylaxis he mentions Stark's theory that there is a "sensitization of the tissues of both the sinus and the orbit by the bacterial

proteins, producing an allergy resulting in a localized anaphylactic reaction each time the individual comes in contact with a fresh infection of the same bacteria in the nose, and possibly in other parts of the body." White says that he has had a few cases presenting symptoms similar to those mentioned by Stark. It had not occurred to him that this would satisfactorily explain the pathology but he believes it is a valuable suggestion; he says that as sinus infections frequently cause asthma it is conceivable that they might also produce engorgement surrounding the optic nerve.

In discussing the subject under the heading of prognosis, White feels that the prognosis depends largely on the duration and extent of the loss of vision, the condition of the fundus, the virulence of the infection and the size of the optic canal.

He mentions the work done by Dr. A. S. McMillan and himself at the Harvard Medical School and in the clinics, also the work of Van der Hoeve. He says that, up to the present, with the exception of pituitary cases, he has been able to find in the roentgen-ray plates but little evidence of pathology adjacent to the optic canal. He cannot agree with Van der Hoeve as to the importance of finding purulent sinusitis adjacent to the canal. The important thing to determine is the size and shape of the optic canal. Adjacent pathology is not so easy to determine; many patients undoubtedly require surgical interference where it is not obviously evident.

Whitnall gives the average diameter of the optic canal as from 5 to 6 mm., while Wilbrand and Saenger give the average as high as 7 mm.

The canals were measured in 164 adult skulls, the average diameter being 5.17 mm. The 5.5 and 6 mm. canals were all round and only two had extensive pneumatization about them. Seven of the 164 canals of 5 mm. were slightly oval, four were triangular and only twelve showed extensive pneumatization. Of the 4.5 mm. canals (twenty in number) twelve were oval or flattened at the top and practically all were two-thirds or three-quarters surrounded by pneumatic sinuses. The three canals of 4 mm. were all oval or irregular, two were nearly surrounded by pneumatized sinuses, the third was in a very dense skull and was probably due to hyperostosis.

The canals were usually found to be round, irrespective of the way examined. The top posteriorly was occasionally flattened, and in a few cases the canal appeared distinctly oval with the horizontal diameter usually the larger. Early in the measurements it became apparent that excessive pneumatization of the sphenoid adjacent to the canal was usually associated with diminution in its caliber. The thinness of the bone separating the inner wall of the optic canal from the sphenoid was noticeable in many specimens; in a few, dehiscences were found, but as these might have resulted from cleaning the skulls, it was thought best not to tabulate them.

The size of the optic canal in infants and children is most instructive. The skulls of forty stillborn infants were examined fluoroscopically. Of these it was possible to make out the canal in twenty. In two the canal was oval and in the remainder approximately round. In none was it less than 4.5 mm. in diameter.

Thus it would appear that the diameter of the optic canal at birth is nearly adult size but very short. There is a rather close analogy between it and the annulus tympanicus. The canal seems to reach adult size early in life. Of these canals in skulls from children under 3 years, four were round and two were slightly oval and all approximately were 5 mm. in diameter. The four canals from skulls, aged from 7 to 8 years, were all round and all about

5 mm. Uniformity in the roentgenograms was obtained by having all the work done by one radiologist, Dr. McMillan.

Normal canals were obtained from twenty-five doctors, nurses and attendants. Five of the fifty canals in this normal series were slightly oval, the vertical diameter being 0.5 mm. shorter than the horizontal. The average diameter was 5.35 mm. Twenty-five cases with optic nerve involvement were then filmed; 26 of these canals were oval. This makes 50 per cent. oval as against 10 per cent. in the normal series. The average diameter of the canals of the patients with optic nerve involvement was ⅔ mm. less than the normal series.

The author feels that if future cases substantiate the results in those already studied, it will mean that whenever we are dealing with optic canals of 4 mm., or less, the appropriate treatment in a case of severe optic nerve involvement will be the immediate ventilation of the posterior sinuses to prevent atrophy unless some other definite focus can be found. A 4.5 mm. canal does not demand such radical treatment. While in canals of 5 mm. or over, the neuritis is probably not a direct extension from the sinus and recovery from any acute attack may be expected either spontaneously or under local treatment. He feels that when no definite explanation can be found for sudden and persistent loss of vision in a patient with a canal of 4 mm. or less, the operation advocated as a therapeutic measure is the removal of the middle turbinate, a larger opening in the front wall of the sphenoid and the uncapping of the posterior ethmoid cell — a simple and comparatively safe surgical procedure to one at all skilled in intranasal technic.

The author feels that complete ethmoid exenteration, unless the cells are definitely infected, does not seem a justifiable or necessary procedure.

H. H. Vail, Cincinnati.

Diseases of the Skin

Erythredema: Pink Disease, So-Called Acrodynia in Infants and Young Children. John Butler, Arch. Dermat. & Syph. **11**:166 (Feb.) 1925.

A case is reported and the literature reviewed. It is argued that the term "erythredema" is preferable to "acrodynia." Acrodynia already has been applied to a condition other than the one under discussion. Erythredema is the term used by Swift, who first described this disease, and in part the name is descriptive of the disease. The discussion mentions pathologic studies by Paterson and Greenfield in which a peripheral sensory polyneuritis and a few cord changes were found, which were interpreted to be toxic rather than inflammatory in character.

Acute Septic Pemphigus. Alfred Schalek, Arch. Dermat. & Syph. **11**:232 (Feb.) 1925.

A brief review of the literature is given and a case is reported. An organism identical with that described by Eberson (*Bacterium pemphigi*) was obtained in cultures. This organism is gram positive, anaerobic, nonmotile and coccoid in form, resembling a streptobacillus in certain respects; it is pathogenic for guinea-pigs and rabbits and possesses definite toxic properties. This same variety of pemphigus has been described by a number of observers in connection with vaccinia. In the discussion following this report it is evident that the organism described is not generally accepted as the cause of acute pemphigus.

Jeans, Iowa City.

A Case of Annular Centrifugal Erythema (or Chronic Migratory Papulo-circinate Erythema) of Darier with Endocrinous Disorders. L. Bory, Bull. Soc. franç. de dermat. et syph. **31**:399, 1924.

In a girl, aged 13, there was a circinate, erythematous eruption involving the entire surface of the skin except the neck and scalp. The first lesion had appeared on the left hip. Each lesion appeared as an erythematous papule which gradually extended peripherally, with complete central involution. There was slight initial pruritus, which soon subsided entirely. Symptoms of exophthalmic goiter were present.

Parkhurst, Toledo, Ohio.

Miscellaneous

Homesickness in Small Children. Georg Schwab, Jahrb. f. Kinderh. **108**:15, 1925.

Homesickness is considered as the desire to return to the former environment when taken to a new environment. Elements of interest to the child in the new environment will decrease the homesickness. Children studied showed a variation from a subnormal homesickness to an increased homesickness, so much that the child would cry continuously while in the hospital ward. The abnormally increased homesickness occurs especially in the only child, whose parents enter to an unusual extent into the activities of the child. Homesickness is closely associated with the development of personality. The treatment depends on a careful study of the child's personality and his relations to his parents and to outside individuals.

Langmann, New York.

Rare Observations in Practice. Siegfried Wolff, Jahrb. f. Kinderh. **108**:55, 1925.

1. Luxatio bulbi oculi as a birth injury. The bulb of the eye was outside the lids and could not be replaced, so it was excised. The wound healed rapidly.

2. Subcutaneous rupture of the trachea. Two cases following trauma to the neck are cited. They were characterized by subcutaneous emphysema and a peculiar far away resonant trumpet tone to the voice. This was a marked characteristic of both cases. One patient was operated on; the other was moribund when seen.

3. Parrot's pseudoparalysis in a boy, aged 7 years, who was one of a syphilitic family and who had had no specific treatment. There was a typical paralysis of one arm, with sudden onset and no swelling or thickening. The Wassermann was ++++. The paralysis decreased after three days of inunctions. No roentgen-ray studies are included. The possibility of trauma is not mentioned.

4. Heart tetany. Two infants with spasmophilia, aged 10 and 14 months respectively, had attacks of marked bradycardia with cyanosis and difficult respirations. Camphor and caffein were used in the immediate treatment. The attacks decreased in number under treatment for the spasmophilia.

5. Continuous swallowing of air by an infant, aged 3 months, was apparently the cause of death.

6. Fatal ileus following intestinal spasm in a new-born infant. The facial phenomenon and fecal vomiting were present.

Sutherland, Chicago.

Society Transactions

ST. LOUIS PEDIATRIC SOCIETY

GEORGE M. TUTTLE, M.D., *President*

Feb. 20, 1925

OTOGENIC MENINGITIS, WITH OPERATION AND RECOVERY. Presented by DR. ARTHUR M. ALDEN.

The patient, V. B., aged 7 years, was admitted to the hospital Jan. 8, 1925, with a history of bilateral earache beginning two days previously. The day before, both ears were opened in the clinic, but as the temperature was very high and the child complained of continuous pain, the mother brought him to the hospital. Examination showed dusky redness of each ear drum with a sag of the posterior superior wall, which was more marked on the right side. On the day of admittance, a bilateral simple mastoidectomy was done under gas anesthesia. All mastoid cells were filled with free pus, and on the right side the tegmen antrae and tympani was soft and necrotic. The mastoid wound was dressed open with a gauze dressing. January 10, the child appeared very sick. White blood cells were 16,000. The temperature was elevated to 40.8 C. (105.4 F.). The child vomited several times and complained of severe headache, especially on the right side. January 11, the white blood cells were 19,000 and the temperature was still up. The child vomited several times during the day and the neck appeared quite stiff. There was a double positive Kernig sign. The fundus examination showed that the disks were slightly blurred with tortuous vessels. There was a suggestive bilateral Babinski sign and an Oppenheim sign on the left side. Spinal puncture showed fluid under slight pressure, with 100 cells per cubic centimeter. A diagnosis of localized otogenic meningitis was made. Under gas and local anesthesia, the right mastoid wound was opened and the lateral sinus was widely exposed. This vessel showed no pathologic changes. The dura over the temporo-sphenoidal region was exposed for an area of about 1.5 inches in diameter. There was considerable bleeding from the dura which was markedly congested, although no free pus was found. The child left the operating room in a fair condition. January 12, the temperature was lower and the child seemed much more comfortable. January 13, the stiffness in the neck and reflexes had all disappeared and the white blood cells were 12,800. From this point on the child made a slow but uneventful recovery and was discharged February 21, with instructions to return for further dressings.

LATERAL SINUS THROMBOSIS. Presented by DR. ARTHUR M. ALDEN.

R. H., a boy, aged 10 years, was admitted to hospital Feb. 3, 1925, with the following history: About three weeks previously, following a severe cold, the child had an elevation in temperature to about 102 F. and complained of pain in the right ear. Two days following, the ear was somewhat swollen and the child's temperature was still high, but the following day the fever abated and the ear discharged profusely. From that time he has had an intermittent fever and a continuous discharge from the right ear. For ten days the boy complained of pain in his legs, which seemed much worse at night. This

pain in the legs, and later in the arms, had been progressive until the last two days before admission; the child slept practically none, and kept the entire family awake by his cries of pain in his limbs. Examination showed that the right ear canal was filled with thick purulent discharge, which when removed showed the entire superior wall of the fundus of the canal to be sagged down, making a view of the drum impossible. There was a moderate cervical adenitis on the right side. Both knees were drawn up and it was impossible to straighten the child out, even for examination, without causing him to scream with pain. His temperature was 103 F. White blood cells were 12,100. A roentgenogram showed complete obliteration of the cellular structure in the right mastoid. Blood culture was negative. A diagnosis of mastoiditis with probable thrombosis of the lateral sinus on the right side was made. Under gas anesthesia, a typical simple mastoid operation was performed. The cells were of the diploic type and there was some bone destruction immediately posterior to the antrum. All mastoid cells were opened and were removed with a curet. The bone covering the lateral sinus was firm and showed no dehiscence; this was removed and the sinus was exposed in the region of the knee. The wall covering the sinus was clean and showed no granulations. However, after the bone covering the sinus was removed, further down just above the jugular bulb the wall of the sinus became discolored and an abscess from which free pus flowed was discovered in the sinus itself. The internal jugular vein was ligated in the lower triangle and the lateral sinus opened posteriorly to within 2 cm. of the superior longitudinal sinus, being filled throughout with a firm hard clot. Free bleeding was not obtained from the posterior end of the sinus, even though a probe was passed back as far as the sinus confluence. The child was sent from the operating room because his condition made it imperative. February 6, the child's condition was much improved; he complained much less of pain in the limbs. February 27, the limbs could be straightened out without pain; the white blood cells were 11,000. From this time on child had an uninterrupted convalescence, and was discharged from hospital, March 1, with the mastoid wound healed. All signs of arthritic disturbances had disappeared.

Spontaneous Facial Paralysis (Due to Cholesteatoma). Presented by Dr. Arthur M. Alden.

G. B., aged 2 years, was admitted to the hospital with the following history: Since contracting a severe cold eight months ago, the child has had an almost continuous discharge from the right ear. This discharge has been profuse and at times has had a very foul odor. Two days previous to admittance, the mother noticed when child awoke one morning that the right side of the face was paralyzed and the right eye could not be closed. Examination showed that the left ear was normal; the right ear canal was filled with thick mucopurulent discharge, which contained some flakes of heavy material. The drum could not be seen on account of the extreme bulging of the posterior wall of the canal. In view of the history of discharging ear and the acute involvement of the facial nerve on this side and the present condition of the canal, a mastoid operation was performed immediately. The child's temperature was 38 C. (100.4 F.). White blood cells, 17,600. Under gas and local anesthesia, a typical simple mastoid incision was made. Removal of the cortex showed that the entire mastoid cavity, the antrum and the attic were filled with a large cholesteatomatous mass. The posterior bony wall was involved just external to the attic. The region of involvement of the facial nerve could not definitely be determined. A typical Bárány operation (consisting in the

total removal of the posterior bony wall of the canal and the external wall of the attic and antrum), was done without a plastic operation. Closure was made by means of a rubber drain and skin clips. February 8, examination of the child showed an almost complete abatement of the facial paralysis, he could now move the lips equally on each side, and the tongue, when protruded, came out in the midline. However, the patient was not able to close the right eye entirely. February 11, the facial paralysis was entirely gone.

This case is of interest for two reasons: (1) Cholesteatoma is very rare in a child of this age because the condition requires, as a rule, a much longer period of chronicity for the formation of a cholesteatoma large enough to cause an erosion of the facial canal with paralysis; (2) the case is also of interest on account of the rapid recovery of the facial paralysis, which of course, was only of two days' duration.

ETIOLOGY OF SYDENHAM'S CHOREA. Presented by DR. S. E. PESETKE.

The true etiology of Sydenham's chorea has not yet been clarified. A large amount of laboratory evidence has been set forth by pathologists and bacteriologists to prove the organic and infectious nature of the disease. This evidence, however, is not convincing, as the findings are often variable and meager, and fail to satisfy the Koch postulates. Many organisms, both bacilli and cocci, have been recovered from the cerebral tissues of patients dying during an attack of chorea, but the relationship of these bacteria to the symptomatology of the disease has not been clearly established.

However, in the clinical relationship of chorea to the infectious processes of rheumatic arthritis and endocarditis and in their turn to tonsillitis, otitis, sinusitis, adenoiditis and dental infection, we have a convincing array of evidence in favor of the infectious nature of chorea. This relationship cannot be accidental for it can be established in from 70 to 85 per cent. of all cases.

There are many striking cases often seen, in which typical rheumatic arthritis accompanies, precedes, or less commonly follows chorea. Recognizing slight arthritic pains or stiffness, "growing pains," also endocarditis or pericarditis without articular symptoms as manifestations of rheumatism in childhood, the proportion of cases of chorea of rheumatic origin is very large.

Poynton and Peterson, in studying 122 cases of acute rheumatism in children, found the association of chorea with rheumatism so common that it would be well to consider all cases of chorea as rheumatic unless another etiology has been proved.

According to Meyer of Basel, the rheumatic basis of chorea lies in the following facts:

1. Chorea is the occasional equivalent for a polyarthritic attack, or after articular rheumatism, takes the place of a relapse.
2. Simultaneously with chorea, other rheumatic manifestations appear.
3. In individuals predisposed to true rheumatism, chorea may introduce the rheumatic condition.
4. In times of the epidemic appearance of articular rheumatism, chorea occurs much more frequently.
5. Certain cases of chorea respond to antirheumatic treatment.
6. The occasional introduction of chorea by prodromes and slight rise of temperature as in other infections.
7. The tendency of chorea to relapse.

If we hope to prevent chorea we must eradicate the foci of infection that initiate the rheumatic syndromes, that is: infected tonsillar ring, adenoids, teeth, sinuses and ears.

Until more convincing evidence is available, the infectious theory of chorea must be accepted as most plausible and probable.

NONSPECIFIC THERAPY IN CHOREA. Presented by DR. J. V. COOKE.

The observation that the course of chorea tends to be considerably shortened if the patient acquires some intercurrent acute pyogenic infection, has suggested that the beneficial effect may be due to the absorption of nonspecific protein substances.

To test this hypothesis, twelve patients with chorea have been treated during the last five years by intravenous injections of typhoid vaccine. One dose of 25 or of 50 million killed organisms has been used. The usual febrile reaction with vomiting and depression followed. Occasionally a second dose was given after an interval of from five to seven days.

The results are somewhat difficult to interpret on account of the notorious variability of the course of chorea. All the patients treated had a moderately severe or a very severe type, and all showed a progressive improvement. This improvement was most marked during the second week after the injection. In all who were treated, the movements had disappeared and the patient was discharged from the hospital within four weeks after the first injection.

The nonspecific therapy was, of course, used in connection with rest in bed and general hygienic care. The impression gained from the treatment of this series of cases was that intravenous protein therapy in severe grades of chorea is free from danger and is of value as a symptomatic treatment in shortening the duration of the choreiform movements.

CARDIAC MANIFESTATIONS OF CHOREA. METHODS OF TREATMENT OF CHOREA IN USE AT RIDGE FARM. Presented by DR. HUGH MCCULLOCH.

Cardiac disease is not a complication of chorea, but should be considered a joint result of some focus of infection, usually in the nose, the throat or the paranasal sinuses. The presence of bacteria or their toxins in the circulating blood may involve the joints, the heart or the kidney and may cause disturbances in the brain.

The treatment at present in use at Ridge Farm, the country convalescent department of the St. Louis Children's Hospital, is based on the assumption that chorea is a disease of the central nervous system, due to the presence of a toxin in the blood affecting the nuclei of the lower part of the brain. It is further assumed that the injury to the brain cells does not completely destroy them, as the posterior column cells are destroyed in poliomyelitis, that the changes taking place may be of such a nature as to disturb the function of the cells or to temporarily do away with their function; that if the focus liberating the toxin or bacteria can be eliminated or the child's resistance built up to withstand the toxin present, that recovery takes place.

Children are selected who have chorea with moderate to severe form of movement and who do not suffer from an acute or active form of heart disease. These children may have heart disease, but there is no evidence that the process is responsible for any of the symptoms.

Without treatment of any kind and after a stay of one day or more in the Children's Hospital they are sent to Ridge Farm. They are put in bed and placed on the routine of the daily life. During the first few days or week, they are left alone as much as possible, bare attention being given to their necessary demands. They are allowed to rest, early and long hours of sleep are encouraged, large amounts of milk are given and a chance to rest and

think things over. No effort is placed on them and they are allowed within these limits to do as they please.

By and by the interest of the child is aroused to the happenings and in the children about the place, and around this interest is built up performances which are within the child's ability to complete successfully. After a few days, they are sent to the schoolroom in bed, and then again are left alone until some interest is aroused. The teacher cultivates and expands this interest into full schoolroom activity.

These children are exposed to sunlight in much the same way that a patient with tuberculosis is treated, using the ordinary principles of heliotherapy. As a result of this the general nutrition is improved, the appetite is stimulated and more satisfactory rest and sleep is secured.

One essential factor in the care of these children with chorea is that they are not exposed to the family criticism for their mistakes. During the interval period of "thinking things over" they soon lose their fear of criticism, nagging or solicitation, as the case may be, and the strong inhibition under which they unconsciously live gives way to relaxation.

The patients who show favorable progress and who have gained in weight after the first week, are then allowed up in a wheel chair, in which they attend school and move about; they are then allowed to walk to the bathroom and in increasing amounts are allowed more exercise. All the children are given a two hour rest period after lunch. The rapidity with which the increase in exercise takes place is based on the weekly gain in weight, the signs of fatigue such as tired feeling or expression, restless sleep or lack of appetite at night, and the progress of chorea movements.

These children are not sent to the dining-room too early, as their awkwardness and mistakes are probably increased when eating in the presence of a large group.

The results of this method of treatment have been most satisfactory. There has been no apparent increase in the number of children who develop heart disease or whose heart disease was made worse. There has been no influence on the recurrence of the disease. The number of days in bed and in the hospital has been shortened. The average length of stay has been six weeks, and the children are not discharged until all movement has ceased and the body weight is normal. The method of treatment is more satisfying to the child as he is happy, is in school, and receives no drugs. There are some children with chorea who do not improve under this method. The condition is mild to moderate in severity and the children have had chorea for a long time.

After a time, when the child seems to be progressing favorably, an effort is made to clean out all infected foci. For this it is necessary to readmit them to the hospital. Several visits may be necessary to clean up a sinus. These operative procedures are not advised when the child is first admitted.

March 20, 1925

PERSISTENT COUGH IN CHILDREN. Presented by DR. KENNETH H. TALLERMAN

Dr. Tallerman stated that the commonest causes of persistent cough in children, aged from 6 to 14 years, were hypertrophied tonsils and adenoids, enlarged hilum glands, particularly those of tuberculous origin, and fibrosis occurring at the base of the lung subsequent to a series of past pulmonary

infections and often measles. The symptomatology and general features of the first two are so well known as to merit but passing attention; the last condition, however, occurs more commonly than usually supposed, and is of importance owing to the fact that it is often erroneously confused with tuberculosis (phthisis), and because of its etiologic significance in the causation of bronchiectasis. The child who is easily tired and rather underweight is brought in on account of cough and poor appetite. The physical signs in this condition are limited to the base and are those commonly associated with a fibrosis, the heart being pulled toward the affected side. The comparative absence of symptoms and these signs should differentiate it from pulmonary tuberculosis, which in any case is exceedingly rare before 10 years of age, and practically never purely basal in position. As a cause of bronchiectasis, fibrosis operates by causing traction on bronchi already weakened by infection and the increased effort of coughing. The treatment is along general and hygienic lines. The prognosis depends on subsequent pulmonary infections and whether or not bronchiectasis develops. The radiologic appearances in this type of fibrosis were dealt with and later discussed by Dr. Sherwood Moore. It was pointed out that the typical picture is one in which a shadow extends down and out from the hilum, and is marked at the affected base, causing a blurring of the diaphragmatic outline. This process is usually associated with peribronchial thickening and enlargement of the hilum glands.

Cough Medicines Employed in Pediatrics: Clinical Observations. Presented by Dr. Gustave Lippmann.

In children suffering from cough, Dr. Lippmann emphasized the importance of rest, of fresh, warm, moist air, and of proper local treatment of the nose and throat. With regard to the efficacy of such commonly used expectorants as ammonium chlorid, and of such syrups as tolu, wild cherry, etc., he expressed himself as a therapeutic nihilist. Most of these preparations, he said, destroy what little appetite the child has, and, if the cough is improved, the improvement is due rather to the general measures. Creosote carbonate, in his hands, is of some advantage clinically. Of the sedatives, codein, in doses large enough to produce the desired effect, most deserved recommendation, especially for children with persistent night cough and without much expectoration.

Cough Medicines Employed in Pediatrics. Pharmacologic Observations. Presented by Dr. Charles M. Gruber.

Expectorants may be defined as agents which facilitate the removal of secretion from the air passages. Several factors play a rôle in this process: (1) The act of coughing; (2) ciliary activity of cells; (3) "peristaltic like" movement in the alveolae and bronchioles and (4) liquefaction of the mucus secreted.

So far as is known, no expectorant drug increases the ciliary activity of the cells or "peristaltic" activity in the alveolae and bronchioles.

The drugs used as expectorants in the treatment of coughs can be classed under three general heads: (1) sedative; (2) irritant, and (3) anodyne expectorants.

1. The sedative expectorants are used especially in the early stages of bronchitis to soothe the acute inflammation by stimulating the secretion of the protective mucus, they comprise (*a*) demulcent expectorants, syrup, honey, syrups of tolu, wild cherry, tar and glycerrhiza; (*b*) saline expectorants,

ammonium chlorid; (*c*) alkaline expectorants, ammonium carbonate, sodium bicarbonate and (*d*) the nauseant expectorants, syrup of ipecac, ammonium chlorid, etc. According to Henderson and Taylor these substances produce increased secretion through reflex action and by their action on the "bronchial gland center."

2. The irritant expectorants, theoretically, irritate the mucous membrane and stimulate repair. This class includes the aromatic expectorants, volatile oils, balsam of Peru, tolu, menthol and terpin hydrate, etc. The exact mechanism of action is not known. They probably act by reflex irritation. McGuigan believes menthol and spirits of peppermint change the surface viscosity.

3. Anodyne expectorants are represented mainly by the opiates: paregoric, morphin, heroin and especially by codein, all in small doses. These are used to depress the excessive cough reflex especially if the secretion is scanty and should not be used if the mucus is excessive. They appear to diminish the secretion presumably because of delay in expulsion permitting drying and reabsorption. Sollmann believes their analgesic action to play some rôle in the lessened tendency to cough. Cushny believes that the slowed respiration which renders it more susceptible to inhibitory impulses brings about the relief of cough without assuming weakened afferent impulses.

Bromids may be valuable in coughs that are due to nervousness. Antipyrin and atropin may be used in pertussis, and epinephrin and atropin are valuable for relieving bronchial spasms due to bronchial asthma.

News and Comment

REDUCTION OF INFANT MORTALITY IN BELGIUM

We are in receipt of a colored map from Belgium, showing a marked reduction in infant mortality in that country since 1905. For the period from 1901 to 1905, the infant mortality was 14.77, in 1922 it was 10.70 and in 1923 it was 9.31 per cent. for the whole country.

Book Reviews

FROM INFANCY TO CHILDHOOD. By RICHARD M. SMITH, M.D. Price, $1.25. Pp. 105. Boston: Atlantic Monthly Press, 1925.

The function of the physician for children is becoming increasingly that of a teacher. In a mother's hands, this little volume should serve admirably as an outline for the more detailed and personal instruction of her medical adviser.

Referring to the desirability of periodic examination of healthy children, the author stresses the importance of "continuity of medical supervision." Familiarity with the individual child greatly enhances the value of the physician's advice.

Throughout the book parents are urged to devote themselves personally to the physical and the mental care of their children. Full responsibility must be assumed by them for any delegated supervision. The chapter on "Training and Education" is especially clear and satisfactory. Brief references to the psychology of childhood are interspersed with such observations as these: "Parents cannot direct a child's mental development by occasional casual instruction. Their contact with the child should be constant and intimate." "Self discipline for the sake of one's children is one of the hard lessons of parenthood, but it is by this road that improvement of one generation over another takes place."

The scope of the book is indicated by the following chapter headings: "Doctor, Mother and Nurse"; "The Nursery"; "Physical Development"; "Care of the Body"; "Clothes"; "Food"; "Daily Routine"; "Sickness"; "Training and Education." The chapter on "Food" is rather brief, covering only twelve pages.

CLINIQUE MEDICALE DES ENFANTS; AFFECTIONS DE L'APPAREIL CIRCULATOIRE. By P. NOBÉCOURT, Professeur de Clinique Medicale des Enfants a la Faculté de Médecine de Paris. Paper. Price, 25 francs. Pp. 372, with 122 illustrations. Paris: Masson et Cie, 1925.

Physicians everywhere, both in the hospital and the home, continually encounter children with affections of the heart. Data accumulating from many observations in cardiac disease furnish the basis for this second volume from the Children's Medical Clinic of Paris, the first having been dedicated to diseases of the respiratory system by the same author.

Nobécourt utilizes fully the dramatic in medicine by presenting, not the case, but the patient himself, with complete roentgenograms, orthodiagrams, pulse tracings, measurements, and, in fatal issues, comprehensive necropsy reports. With each discussion, the literature is exhaustively reviewed, and the experiences of the clinician in previous invasions of like character are freely drawn on. The difficulties of diagnosis, the limitations in the prognosis, the numerous factors involved in outlining a rational therapy and particularly the need of maintaining, in complicated cases, a judicious attitude, neither over-optimistic nor unduly pessimistic—all are sufficiently stressed.

Entire chapters are devoted to endocarditis of scarlatinal, rheumatic and tuberculous origin; to the various forms of mitral and aortic disease; to pericarditis, chorea and the cardiohepatic syndrome of infancy. Altogether, this is a work worthy of its distinguished author.

LA REACTION DE FIXATION DANS LA TUBERCULOSE. PAR ACHILLE URBAIN. Preface de A. BESREDKA, professeur a l'Institut Pasteur. Paper. Price, 12 francs. Pp. 132. Paris: Masson et Cie, 1925.

A technical exposition of the field of complement fixation as applied to tuberculosis, with an exhaustive bibliography of manifest value to laboratory workers and clinicians alike.

As a means of diagnosis, Besredka points out how strikingly complement fixation tests may supplement the physical examination, especially when regions ordinarily inaccessible are involved. He disclaims, however, the possibility of thus interpreting the character of the tuberculous process, or of compromising the prognosis by fruitless speculation as to whether the lesion is in an evolutive or a retrogressive stage. One must expect about the same measure of assistance as that given, for example, by the Widal reaction.

Where there is disagreement between the laboratory and clinical findings, there are but two possible hypotheses: either the reaction of fixation lacks specificity or the technic employed lacks precision.

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